



COLONY OF MAURITIUS

DEPARTMENT OF AGRICULTURE

Fifth Annual Report of the Sugarcane
Research Station, for the year 1934.

SUGARCANE RESEARCH STATION, MAURITIUS

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Fifth Annual Report of the Sugarcane Research Station, Mauritius, for the Year 1934.

INTRODUCTION

BY OFFICER IN CHARGE.

The Station being up to full strength, for practically the whole year, steady progress was made with the research programmes of the various divisions whose reports appear below.

On 31st March the annual contribution from the Empire Marketing Board towards the cost of the Station ceased owing to the abolition of the Board, so that the Station lost an annual grant of Rs. 22,204. As the Board's contribution was originally granted for a period of 5 years, as from January 1930, the Board's commitments in respect of the last 9 months of 1934 were met by a grant from the Colonial Development Fund.

With regard to future financing, the Committee of the Sugar Industry Reserve Fund of the "Chambre d'Agriculture" have agreed to give financial assistance to the Station, a sum of Rs. 7,000 being voted by the Committee for the period January-June, 1935. This sum, together with Rs. 9,000 contributed by the Board of the College of Agriculture for the same period, will cover half the cost of the Station for the period January-June 1935 the other half being met from Colonial Government funds.

In February the writer proposed that a research advisory committee for the Station should be formed consisting of representatives of the sugar industry and the Research Station, the Director of Agriculture being Chairman. This committee was formed during the year, the following gentlemen, representing the industry, being nominated by His Excellency the Governor: Messrs. J. D. de Spéville, P. de Sornay (Chev. Lég. Hon.), F. North Coombes, G. Wiehe and G. P. Langlois. This committee should prove of considerable value to the Station by affording full opportunity for the discussion of results and guiding the trend of future research work.

The Station now benefits by having the part-time services of the newly appointed Agronomist of the Department of Agriculture who has taken over much of the detailed work connected with our numerous field experiments thus allowing us to expand this essential branch of our activities.

PART I—CANE BREEDING

BY A. GLENDON HILL.

General.

The cane-breeding policy remained unchanged during the year, the extensive breeding of "noble" and nobolised Glagah types being carried out on two experimental stations as well as on certain estates where special facilities were kindly granted as in the past. A summary of this breeding work and that of the four previous years is given in Table I, while in Table II a list of crosses made during the year is shown.

The Maintenance of Seedling Characters.—A considerable amount of time was given during the year to a detailed analysis of cane characters as observed in 1st year seedling selections and identical characters as observed in the same clones in their 2nd trials. The behaviour of such factors as Weight-per-Stool and Total Solids % Juice as observed in newly selected varieties appear to be imperfectly understood but as these are the ultimate factors governing yield of sugar per acre it is essential that they should be studied in detail. The results of this investigation, published fully elsewhere, can be summarised as follows. The characters of Weight-per-Stool and Total Solids % Juice were examined in the case of 418 1st-year seedling selections and compared with the same characters exhibited in these 418 clones in their 2nd-year trial. In addition, the character Number of Canes per Stool was examined for 166 seedlings of the above 418. The results of the investigation showed the following relationship between the 1st* and 2nd year trials.

Characters	1st-Year Trial	2nd-Year Trial	Increase + or Decrease—	Correlation between 1st and 2nd Year Trial Characters
Mean Weight per Stool ...	22.5 kgs	9.7 kgs.	— 57.00%	+ 0.222 $\pm$ 0.031
Mean Total Solids	19.2%	18.7%	— 1.25%	+ 0.415 $\pm$ 0.037
Mean Cane Number ...	12.6 canes	7.0 canes	— 44.50%	+ 0.282 $\pm$ 0.048
Correlation between Weight per Stool and Cane Number = + 0.671 $\pm$ 0.028				

Contrary to recent work published elsewhere the results of this investigation suggest that Weight-per-Stool is normally exaggerated in our 1st-Year seedling selections and is therefore not to be depended upon to reproduce itself subsequently. Further, as selected clones seldom equal or exceed their 1st-trial performance, a minimum weight limit might be set for 1st-year selections.

The character Cane Number appears to be in the same category as Weight-per-Stool as regards its maintenance and as its decrease approximates to the falling off in Weight-per-Stool it indicates that this decrease in weight is chiefly due to the decrease in Cane Number and not to a decrease in length or diameter of individual cane-stalks. This is borne out by the high positive correlation of + 0.671 $\pm$ 0.028 between Weight-per-Stool and Cane Number found in these 166 clones in their 1st year trial. The writer is of the opinion that other characters such as freedom from arrows and good bud-habit, although satisfactory in 1st-year selections sometimes appear to deteriorate in subsequent trials. Further investigations may show the desirability of allowing all newly produced seedlings to settle down for one or two seasons in order to allow exaggerated hybrid vigour to abate and undesirable traits time to appear before attempting to assess qualitative characters. This is now being tested. In connection with hybrid vigour, Ashby's work on maize is suggestive where he states that "Hybrid vigour is nothing more than a maintenance of an initial advantage in embryo size."

* The term 1st-Year Trial as used here refers to the original crop raised from fuzz or true seed.

† Ann. Bot. XLIV, 457, 1930. Ibid XLVI, 1007, 1932.

Analysis of Parentage 1930-1934.—A lengthy analysis of all parents and combinations used for the past 5 years and the resulting seedlings selected for 1st, 2nd, 3rd and subsequent trials shows that the time has now come when we can safely and gradually cut down the number of crosses made annually and concentrate on those few which have given really promising seedlings. This investigation, in which I have had much help from my Scientific Assistant, will allow us to devote an increasing amount of time to the testing of those new varieties bred since 1930 and now undergoing their 3rd and 4th trials.

Uba Marot, origin of.—This interesting local variety, of unknown origin, has proved so promising as a parent that its origin is thought to be of considerable importance. A study of selfs recently raised has given no indications as to its origin but has, incidentally, yielded several clones with richer juice than Uba Marot which is normally poor in sucrose. In the opinion of Dr. Posthumus, of the Proefstation-Oost-Java, writing recently, Uba Marot is not a sport of Uba, a view that is supported by its chromosome number of 112-113 determined by Bremer, Uba itself having 116-118. This view is further supported by the nature of the root system of Uba Marot as compared with Uba and described by H. Evans. The alternative name of Gros Cailloux would therefore seem to be more appropriate for this variety.

Intergeneric and Interspecific Crosses.—A cross between sugarcane and sorghum was achieved by the Cane Breeding Officer, for the first time in Mauritius, numerous hybrids of very diverse type being produced. Unfortunately they were all alike in being sterile so that no back-crossing could be attempted with them. The same sterility has been reported from India where this cross was first achieved.

The interesting hybrids recently produced between *Saccharum officinarum* and *S. Munja* (= *Erianthus sara*) have not so far proved to be as promising for breeding material as 1st-nobilised Glagah clones.

Maturity Tests.—The juices of all new seedling varieties undergoing their 3rd and subsequent trials are now tested for total solids throughout the ripening season, as a routine procedure, in order to determine the early and late maturing clones.

During an investigation on regional maturity carried out by the Cane Breeding Officer, using Fisher's test of significance, it was found that a difference in total solids of 1.0 in the juice was significant and a difference of 1.5 highly significant, as between the top, middle and bottom of cane stalks.

Early Selection Experiments.—Trials are still being carried out to determine whether it is safe to eliminate puny seedlings at the seed-box or potting-out stages of growth before transplanting to the field as potted plants, thus saving a considerable amount of expense and labour.

Fuzz Storage Tests.—The latest experiment conducted by the Cane Breeding Officer shows that cane seed can be stored in dessicators in a viable condition for 12 months the germination up to 9 months being high and then falling off rapidly.

VARIETY TESTS

Promising New Seedling Varieties.—Of the many seedlings, bred by the Station, now undergoing their 3rd trial, those of the 4th Nobilised Glagah type show most promise several of these appearing to be outstanding canes. The best of these will be multiplied as rapidly as possible after next harvest. As disease resistance trials have been carried out by the Mycologist at the same time as these yield trials there should be no risk of releasing a high-yielding variety only to find later that it is subject to Gummosis.

With regard to varieties for *Phytophthora* infested land, several promising seedlings of great root vigour are now undergoing their 3rd and 4th trials and should be ready for multiplication and general distribution after next crop. The *Phytophthora* resistance trials being conducted by the Physiological Botanist and the *Phytophthora* Investigation Officer with certain of our new resistant seedlings should give us a valuable comparison between the behaviour of these types and the ordinary standard canes under induced *Phytophthora* attack.

New Variety Yield Trials laid down in 1934.—Now that the supply of planting material of certain new varieties no longer presents the difficult problem that it did, larger sized yield trials, on the randomised block lay-out, have been established to replace the row trials previously laid down. In these new trials, two buffer rows, to be discarded at harvest, are included one on each long side of every plot so as to minimise, as far as possible, the effect of varietal competition. Fourteen such trials were laid down in 1934 on experiment stations and estates.

Results of Variety Trials cut in 1934.—The results of 15 trials cut during the year are summarised below. It should be noted that any conclusions drawn are from the sucrose per arpent* figures and not from cane tons per arpent.

It will be noticed that the results from several newly introduced varieties appear for the first time (Trial 44).

The following amongst the newer varieties are recommended for trial on those estates which have not yet tried them: Selangor Seedling, S.W. 499, POJ. 2878 and POJ. 2725.

Many S.R.S. seedlings have now reached their 3rd trial stage and certain of these will soon be ready for distribution and trial on estates. No seedlings bred by the Station since it opened have yet been released for general distribution although several of a special type have been sent to various estates for multiplication with a view to conducting field trials with them later on *Phytophthora* infested land.

A. GLENDON HILL,

Senior Geneticist, in charge Sugarcane Research Station.

Réduit,

January, 1935.

* 1 arpent = 1.043 acres.

TRIAL NO. 55, REDUIT (VIRGINS).

Variety		Sucrose tons per arpent	Sucrose % Cane	Cane tons per arpent	Arrows % cane
M.106/30	...	6.93	12.5	55.4	57
M. 71/30	...	6.16	14.2	43.4	0
M.108/30	...	5.71	14.3	40.0	22
M. 28/30	...	4.67	15.5	30.1	0
White Tanna	...	1.63	14.3	11.4	0
Mean	...	5.02	—	36.06	—
S.E.	...	± 0.27	—	± 1.95	—
Significant difference	...	0.80	—	5.73	—

Planted :—27.8.33.

Cut :—22.11.34.

Remarks : M. 106/30, in spite of a high percentage of arrows, gave a significantly better yield than the other varieties. M. 108/30 and M. 71/30 were significantly better than M. 28/30 and White Tanna. M. 106/30 and M. 108/30, which are seedlings of POJ. 2878 x Uba Marot and promising for Phytalus areas, have been put into a further trial on Phytalus infested land but it is felt that they will be superseded by better, non-arrowing, seedlings of the same cross. M. 28/30 has also been selected for further trial.

TRIAL NO. 44, REDUIT (VIRGINS).

Variety		Sucrose tons per arpent	Sucrose % Cane	Cane tons per arpent	Arrows % cane
Selangor Seedling	...	3.11	13.4	23.2	38
S.W.499	...	2.67	12.2	21.9	7
B.H.10(12)	...	2.00	12.4	16.2	0
POJ.2940	...	1.96	13.2	14.8	49
S.C.12(4)	...	1.87	13.4	14.0	33
D.I.52	...	1.37	13.7	10.0	0
POJ.2747	...	1.19	12.9	9.2	65
Mean	...	2.03	—	15.6	—
S.E.	...	± 0.18	—	± 1.38	—
Significant Difference	...	0.52	—	3.99	—

Planted :—16.2.33.

Cut :—5.11.34.

Remarks : Selangor Seedling and S.W. 499 were significantly better than all the other varieties including BH.10(12), the standard. This trial, which was adjacent to No. 43, suffered severely from drought.

TRIAL NO. 43, REDUIT (VIRGINS).

Variety		Sucrose tons per arpent	Sucrose % Cane	Cane tons per arpent	Arrows % cane
M. 5/30	...	3.08	12.5	24.7	0
M.10/30	...	2.36	12.6	18.7	0
M.13/30	...	2.00	13.1	15.3	0
M.18/30	...	1.91	13.6	14.0	74
M.11/30	...	1.69	13.3	12.7	0
White Tanna	...	1.68	13.1	12.8	0
M. 8/30	...	1.58	13.0	12.1	0
Mean	...	2.05	—	15.7	—
S.E.	...	± 0.19	—	± 1.46	—
Significant Difference	...	0.57	—	4.36	—

Planted :—24.1.33

Cut :—14.11.34.

Remarks : M. 5/30 and M. 10/30 were significantly better than the Standard, White Tanna, M. 5/30 being significantly better than M. 10/30. None of the other varieties were significantly worse than White Tanna.

Nos. M. 5/30 and M. 10/30 are being tested again in a 4th trial before deciding whether to release them for distribution. This experiment suffered severely from drought.

TRIAL NO. 42, PAMPLEMOUSSES (VIRGINS)

	Sucrose t.p.a.	Cane t.p.a.	Sucrose % cane	Arrows % cane
Average yield of 31 plots of BH.10(12) = 3.78	(22.41)		16.9	0.0
Average difference of 5 plots of M.54/30 = 3.78 - 0.33	(25.16)		13.5	37.3
Average difference of 5 plots of M.57/30 = 3.78 - 0.57	(22.13)		14.5	52.0
Average difference of 5 plots of M.59/30 = 3.78 - 0.04	(21.71)		16.0	9.4
Average difference of 5 plots of M.78/30 = 3.78 - 0.67	(22.27)		14.2	75.7
Average difference of 5 plots of M.88/30 = 3.78 + 2.32	(41.18)		14.8	98.0
Average difference of 5 plots of M.96/30 = 3.78 - 0.32	(30.99)		11.1	91.4
S.E. = ± 0.36 .	Planted : -20.2.33.	Cut : -23.11.34.		

Remarks : M. 88/30 was significantly better than the standard BH.10(12) but owing to its high percentage of arrows is not to be recommended.

TRIAL NO. 41, PAMPLEMOUSSES (VIRGINS).

	Sucrose t.p.a.	Cane t.p.a.	Sucrose % cane	Arrows % cane
Average yield of 31 plots of BH.10(12) = 3.77		24.79	15.2	0.0
Average difference of 5 plots of M.27/30 = 3.77 + 0.49		26.90	15.8	66.6
Average difference of 5 plots of M.28/30 = 3.77 - 0.17		26.44	13.7	1.8
Average difference of 5 plots of M.41/30 = 3.77 + 1.31		36.34	14.0	29.7
Average difference of 5 plots of M.46/30 = 3.77 + 0.51		31.27	13.7	25.5
Average difference of 5 plots of M.48/30 = 3.77 + 1.57		37.73	14.1	28.1
Average difference of 5 plots of M.50/30 = 3.77 + 0.98		32.93	14.4	75.0
S.E. = ± 0.27	Planted : -20.2.33.	Cut : -21.11.34.		

Remarks : M.41/30, M.48/30 and M.50/30 were significantly better than the standard BH.10(12). The first two of these will be put into a further (4th) trial before considering their release.

TRIAL NO. 40, PAMPLEMOUSSES (VIRGINS).

Variety	Sucrose tons per arpent	Sucrose % Cane	Cane tons per arpent	Arrows % cane
M. 2/29	... 9.46	16.0	59.13	40.0
M.22/29	... 7.47	12.9	57.85	38.4
M.19/29	... 3.70	14.4	25.67	0.0
BH.10(12)	... 3.05	15.3	19.89	0.0
M.17/29	... 2.94	12.7	23.15	10.4
Mean	... 5.32	14.3	37.14	—
S.E.	... ± 0.34	—	± 2.49	—
Significant Difference	... 1.04	—	7.44	—
	Planted : -6.1.33	Cut : -26.11.34.		

Remarks : None of the seedlings in this trial have been retained owing to their bad growth-habit.

TRIAL NO. 38, BEAU CHAMP S.E. (1ST RATOONS).

	Sucrose t.p.a.	Cane t.p.a.	Sucrose % cane
Average yield of 42 plots of White Tanna	= 2.76	(21.9)	12.6
Average difference of 5 plots of BH.10(12)	= 2.76 + 1.63 =	(31.4)	14.0
Average difference of 5 plots of POJ.2878	= 2.76 + 4.24 =	(44.0)	15.9
Average difference of 5 plots of POJ.2725	= 2.76 + 3.68 =	(43.0)	15.0
Average difference of 5 plots of M.23/16	= 2.76 + 0.79 =	(30.9)	11.5
Average difference of 5 plots of M.27/16	= 2.76 + 1.06 =	(30.1)	12.7
Average difference of 5 plots of M.29/16	= 2.76 + 2.46 =	(39.9)	13.1
Average difference of 5 plots of M.109/26	= 2.76 + 1.60 =	(32.1)	13.6
Average difference of 5 plots of M.14/26	= 2.76 + 0.21 =	(24.2)	12.3
S.E.	= ± 0.20	Cut :—12.9.34 and in 1933 on 7th December.	

Remarks : All the varieties, excepting M.14/26, were better than White Tanna, the Standard. As in the case of the virgin crop, the performance of POJ.2878 was remarkably good.

TRIAL NO. 33, TRIANON S. E. (VIRGINS)

	Sucrose t.p.a.	Cane t.p.a.	Sucrose % cane
Average yield of 31 plots of DK.74	... = 2.74	= (20.6)	13.3
Average difference of 5 plots of POJ.2878	= 2.74 + 1.66 =	(28.0)	15.7
Average difference of 5 plots of POJ.2725	= 2.74 + 1.67 =	(28.7)	13.3
Average difference of 5 plots of M. 47/26	= 2.74 - 0.06 =	(18.3)	14.7
Average difference of 5 plots of M.109/26	= 2.74 + 0.82 =	(25.0)	14.2
Average difference of 5 plots of M. 14/26	= 2.74 + 1.59 =	(30.9)	14.0
Average difference of 5 plots of M. 13/18	= 2.74 + 1.64 =	(31.8)	13.8
S.E.	= ± 0.22	Planted :—September 1932.	Cut :—1.12.34.

Remarks : All varieties, excepting M.47/26, were significantly better than the Standard D.K.74. There was no significant difference between POJ.2878, M.14/26 and M.13/18 which were all significantly better than the rest. This trial suffered very severely from drought and borer attack.

TRIAL NO. 32, PAMPLEMOUSSES (1ST RATOONS)

	Sucrose t.p.a.	Cane t.p.a.	Su- crose%	Arrows % cane
Average yield of 19 plots of BH.10(12)	= 5.04	= (29.99)	17.4	0.0
Average difference of 3 plots of POJ.2725	= 5.04 + 1.97 =	(42.62)	16.8	13.1
Average difference of 3 plots of POJ.2878	= 5.04 + 0.21 =	(33.89)	15.9	22.9
Average difference of plots of S.C.12(4)	= 5.04 - 2.04 =	(20.89)	15.4	0.0
Average difference of 3 plots of Selangor				
Seedling	... = 5.04 + 0.29 =	(35.44)	15.6	0.0
Average difference of 3 plots of M.109/26	= 5.04 - 0.29 =	(35.98)	13.5	11.9
Average difference of 3 plots of M. 14/26	= 5.04 - 0.83 =	(33.98)	12.7	0.0
S.E. -	± 0.51	Cut :—29/11/34 and in 1933 on 24th November.		

Remarks : POJ. 2725 was significantly better than BH.10(12), the standard, but there was no significant difference between the standard and POJ.2878, Selangor Seedling, M.109/26 and M.14/26. S.C.12 (4) was significantly worse than the standard.

TRIAL NO. 17, REDUIT (1ST RATOONS)

	Sucrose t.p.a.	Cane t.p.a.	Sucrose % cane
Average yield of 6 plots of R.P.8	= 4.22	= (32.3)	12.7
Average difference of 6 plots of POJ.2878	= 4.22 + 0.60	= (30.1)	16.0
Average difference of 6 plots of POJ.2725	= 4.22 + 0.18	= (28.2)	15.5
S.E. = ± 0.87	Planted : 18.9.31.	Cut : October 1934 and in 1933	on 29th August.

Remarks : There was no significant difference between the two POJ. varieties and the standard.

TRIAL NO. 16, PAMPLEMOUSSES (2ND RATOONS)

	Sucrose t.p.a.	Cane t.p.a.	Su- crose%	Arrows %
Average yield of 25 plots of BH.10(12)	= 4.83	= (29.15)	16.6	0.0
Average difference of 8 plots of POJ.2878	= 4.83 + 1.18	= (34.51)	17.4	3.2
Average difference of 8 plots of POJ.2725	= 4.83 + 0.95	= (35.49)	16.3	0.9
Average difference of 8 plots of M.23/16	= 4.83 + 0.13	= (33.99)	14.6	0.0
S.E. = ± 0.35	Cut : 30.11.34 and in 1933	on 20th November.		

Remarks : Both the POJ. varieties were significantly better than BH.10(12) the standard but no significant difference was observed between M.23/16 and BH.10(12).

TRIAL NO. 15, BRITANNIA S. E. (1ST RATOONS)

	Sucrose t.p.a.	Cane t.p.a.	Sucrose % cane
Average yield of 18 plots of White Tanna	= 4.53	= (31.5)	14.4
Average difference of 5 plots of M.23/16	= 4.53 - 0.55	= (29.3)	13.6
Average difference of 5 plots of M.27/16	= 4.53 - 1.45	= (23.9)	12.9
Average difference of 5 plots of M.13/18	= 4.53 - 1.56	= (23.2)	12.8
Average difference of 5 plots of M.26/20	= 4.53 - 1.34	= (20.9)	15.3
Average difference of 5 plots of M. 5/22	= 4.53 - 2.47	= (15.4)	13.4
Average difference of 5 plots of M. 7/23	= 4.53 - 1.38	= (21.3)	14.8
Average difference of 5 plots of M. 9/24	= 4.53 - 2.91	= (11.0)	14.7
Average difference of 5 plots of M. 6/25	= 4.53 - 1.12	= (24.4)	14.0
Average difference of 5 plots of M.14/26	= 4.53 - 2.44	= (13.8)	15.1
Average difference of 5 plots of M.109/26	= 4.53 - 1.86	= (18.1)	14.8
Average difference of 5 plots of BH.10(12)	= 4.53 - 1.02	= (22.5)	15.6
Average difference of 5 plots of LB.111/14	= 4.53 - 1.76	= (22.0)	12.6
Average difference of 5 plots of POJ.2725	= 4.53 - 0.21	= (27.9)	15.5
Average difference of 5 plots of POJ.2878	= 4.53 + 0.23	= (27.0)	16.2
Average difference of 5 plots of R.P.6	= 4.53 - 0.94	= (24.6)	14.6
Average difference of 5 plots of R.P.8	= 4.53 - 2.20	= (18.5)	12.6
S.E. = ± 0.34	Cut : 5-6.11.34, and in 1933	at end of August.	

Remarks : The difference between White Tanna, the standard, and M.23/16, POJ.2725, POJ.2878 was not significant. All the other varieties in the trial were significantly worse than White Tanna.

TRIAL NO. 3, ST. AUBIN S. E. (3RD RATOONS)

	Sucrose t.p.a.	Cane t.p.a.	Sucrose % cane
Average yield fo 31 plots of White Tanna	4.91	= (33.6)	14.6
Average difference of 5 plots of M. 12/21	= 4.91 - 2.13	= (20.9)	13.3
Average difference of 5 plots of M. 5/22	= 4.91 - 1.01	= (28.5)	13.7
Average difference of 5 plots of M. 7/23	= 4.91 + 0.69	= (35.5)	15.8
Average difference of 5 plots of M. 10/25	= 4.91 + 0.65	= (39.2)	14.2
Average difference of 5 plots of M. 14/26	= 4.91 - 0.50	= (30.2)	14.6
Average difference of 5 plots of M.109/26	= 4.91 - 0.06	= (31.4)	15.4
S.E. = ± 0.33	Cut : 17, 20, 21.11.34, and in 1933 on 31st October.		

Remarks : M.7/23 and M.10/25 were better than all the other varieties, including White Tanna the standard.

TRIAL NO. 2, ST. AUBIN S. E. (3RD RATOONS)

	Sucrose t.p.a.	Cane t.p.a.	Sucrose % cane
Average yield of 31 plots of White Tanna	= 4.03	= (27.0)	15.0
Average difference of 5 plots of M.27/16	= 4.03 + 1.36	= (36.1)	15.0
Average difference of 5 plots of M.13/18	= 4.03 + 1.68	= (39.3)	14.6
Average difference of 5 plots of M.17/18	= 4.03 - 1.45	= (18.0)	14.5
Average difference of 5 plots of M.33/19	= 4.03 - 1.60	= (17.1)	14.3
Average difference of 5 plots of M.15/20	= 4.03 - 0.81	= (22.5)	14.4
Average difference of 5 plots of M.26/20	= 4.03 + 0.18	= (27.0)	15.7
S.E. = ± 0.28	Cut : 13-14.11.34 and in 1933 on 25th October.		

Remarks : M.27/16 and M.13/18 were better than all the other varieties including White Tanna, the standard.

TRIAL NO. 1, ST. AUBIN S. E. (3RD RATOONS)

	Sucrose t.p.a.	Cane t.p.a.	Sucrose % cane
Average yield of 67 plots of White Tanna	= 4.28	= (28.6)	15.0
Average difference of 11 plots of BH.10(12)	= 4.28 + 0.38	= (28.4)	16.4
Average difference of 11 plots of R.P.6	= 4.28 + 0.90	= (34.3)	15.1
Average difference of 11 plots of R.P.8	= 4.28 + 0.41	= (31.5)	14.9
Average difference of 11 plots of M.23/16	= 4.28 - 0.10	= (27.9)	15.0
Average difference of 11 plots of M.27/16	= 4.28 - 0.04	= (29.0)	14.6
Average difference of 11 plots of M.12/21	= 4.28 - 2.98	= (9.5)	13.6
S.E. = ± 0.24	Cut : 15-17.11.34, and in 1933 on 28th October.		

Remarks : R.P.6 was significantly better than all the other varieties including White Tanna, the standard.

TABLE I
SUMMARY OF CANE-BREEDING WORK, 1930 TO 1934.

	1930	1931	1932	1933	1934
(1) Controlled crosses made including selfings	409	355	457	466	421
(2) Uncontrolled crosses	569	370	46	1	0
(3) 1st-Year Seedlings raised in boxes	52,840	72,888	157,948	64,883	95,105
(4) 1st-Year Seedlings potted out for planting	20,108	29,363	35,863	26,032	28,318
(5) 1st-Year Seedlings distributed to estates for planting	3,000	5,000	16,040	3,645	4,550
(6) Mature seedlings from (4) and (5) above selected for testing in 2nd trials	233 = 1%	263 = 1%	252 = 1%	—*	—
(7) 2nd trial seedlings from (6) above selected for testing in 3rd trials	46 = 20%	57 = 22%	6†	—	—
(8) 3rd trial seedlings from (7) above selected for testing in 4th trials	5† = 11%	—	—	—	—

* Not yet selected.

† Not yet completed.

TABLE II.

LIST OF CROSSES MADE DURING SEASON 1934.

1. CROSSES BETWEEN " NOBLE " CANES.

COMBINATION		Location of cross	No. of crosses made	No. of seedlings obtained	No. of seedlings planted in the field	
					C.E.S.	P.E.S.
Ba.11569	x D.109, white	C.E.S.	1	3,000	264	—
Ba.11569	x DK.74	P.E.S.	1	1,576	—	0
Ba.11569	x M.23/16	P.E.S.	1	65	—	22
Ba.11569	x M.27/16	P.E.S.	1	2,198	—	90
Ba.11569	x M.109/26	P.E.S.	1	1,133	—	100
Ba.11569	x M.88/30	P.E.S.	1	104	—	12
Ba.11569	x SW.499	P.E.S.	1	3,107	—	152
Ba.11569	x 55.P	P.E.S.	1	107	—	36
Ba.11569	x 131.P	P.E.S.	1	160	—	132
Bambou Rayée	x BH.10(12)	P.E.S.	1	21	—	16
Bambou Rayée	x M.27/16	P.E.S.	1	1,237	—	0
Bambou Rayée	x M.88/30	P.E.S.	1	109	—	81
Bambou Rayée	x S.C.12(4)	P.E.S.	1	2,098	—	107
BH.10(12)	x DK.74	Beau Bassin	1	0	0	—
BH.10(12)	x M.27/16	Béga	1	15	0	—
H.109	x D.109, white	P.E.S.	1	295	—	120
H.109	x M.23/16	C.E.S.	1	0	0	—
H.109	x M.24/16	C.E.S.	1	22	13	—
H.109	x SW.499	P.E.S.	1	78	1	36
Louzier	x BH.10(12)	P.E.S.	1	978	—	339
M.20/16	x BH.10(12)	C.E.S.	1	7	0	—
M.20/16	x DK.74	C.E.S.	2	2	0	—
M.23/16	x BH.10(12)	P.E.S.	2	25	—	20
M.23/16	x D.109	P.E.S.	1	23	—	0
M.23/16	x D.109, white	P.E.S.	2	274	—	96
M.23/16	x M.27/16	P.E.S.	2	72	—	17
M.23/16	x M.109/26	P.E.S.	2	135	—	44
M.23/16	x S.C.12(4)	P.E.S.	2	123	—	74
M. 1/17	x S.C.12(4)	P.E.S.	1	2,154	—	202
M.33/19	x BH.10(12)	P.E.S.	2	25	—	16
M.33/19	x BH.10(12)	C.E.S.	1	0	0	—
M.33/19	x M.85/17	C.E.S.	1	15	0	—
M.33/19	x S.W.499	P.E.S.	1	2,067	—	0
M.10/22	x Senneville	P.E.S.	1	0	—	0
M.14/26	x BH.10(12)	P.E.S.	2	0	—	0
M.14/26	x D.109	Mon Rocher	1	1	—	0
M.14/26	x DK.74	Mon Rocher	1	4	—	0
M.14/26	x M.109/26	Mon Rocher and P.E.S.	2	11	—	0
M.14/26	x S.C.12(4)	Mon Rocher	1	0	—	0
M.109/26	x M.35/17	C.E.S.	2	700	0	—
M.12/29	x M.27/16	P.E.S.	1	25	—	21
M.12/29	x S.C.12(4)	P.E.S.	1	588	—	139
M.14/29	x BH.10(12)	P.E.S.	1	0	—	0
Mapou Perlée	x D.1135	Trianon S. E.	2	75	38	—
R.P.6	x BH.10(12)	C.E.S.	1	0	0	—
R.P.6	x BH.10(12)	P.E.S.	2	3	—	0
R.P.6	x M.27/16	C.E.S.	2	135	0	—
R.P.6	x M.27/16	P.E.S.	1	494	—	0
R.P.6	x S.C.12(4)	P.E.S.	1	1,893	—	96
R.P.6	x S.W.499	P.E.S.	1	341	—	55
R.P.8	x DK.74	Beau Bassin and Ebène S.E.	8	5,527	502	—
R.P.8	x D.109, white	Ebène S.E.	1	95	30	—
R.P.8	x D.109, str.	Ebène S.E.	1	0	0	—
R.P.8	x D.1135	Ebène S.E.	1	0	0	—
R.P.8	x 55.P	Beau Bassin	1	9	8	—
R.P.8	x M.27/16	Beau Bassin	3	5,375	464	—
R.P.8	x M.13/18	Beau Bassin and Ebène S.E.	4	3,555	402	—

1. CROSSES BETWEEN " NOBLE " CANES.—*Continued*

COMBINATION		Location of cross	No. of crosses made	No. of seedlings obtained	No. of seedlings planted in the field	
					C.E.S.	P.E.S.
R.P.8	x M.109/26	Ebène S.E.	3	31	0	—
S.W.499	x M.13/18	C.E.S.	1	100	0	—
S.W.499	x S.C.12(4)	C.E.S.	1	25	0	—
White Tanna	x BH.10(12)	Australia	6	0	—	0
White Tanna	x DK.74	Beau Bassin	2	1	0	—
White Tanna	x M.13/18	Beau Bassin	1	0	0	—
W. Tanna M. Désert	x BH.10(12)	Australia	1	0	—	0
W. Tanna St. Aubin	x BH.10(12)	Australia	1	0	—	0
55.P	x M.109/26	P.E.S.	1	1,090	—	122
55.P	x S.C.12(4)	P.E.S.	1	1,800	—	247
55.P	x S.W.499	P.E.S.	1	40	—	0
TOTAL ...			101	48,143	1,721	2,488

2. INTER-SPECIFIC CROSSES.

I. 2ND NOBILISED GLAGAH :

Bambou Rayée	x MZ.24/31	P.E.S.	1	145	—	0
Ba.11569	x MZ.24/31	P.E.S.	1	49	—	0
Kassoer	x BH.10(12)	P.E.S.	2	1	—	0
Kassoer	x D.109, str.	P.E.S.	1	0	—	0
Kassoer	x DK.74	P.E.S.	1	21	—	16
Kassoer	x DK.74	C.E.S.	1	2	0	—
Kassoer	x M.27/16	C.E.S.	1	1	0	—
Kassoer	x M.35/17	C.E.S.	1	250	0	—
Kassoer	x M.35/17	P.E.S.	1	25	—	13
Kassoer	x M.109/26	P.E.S.	1	7	—	0
Kassoer	x Senneville	P.E.S.	1	21	—	0
Kassoer	x 131.P	P.E.S.	1	46	—	23
Mapou Perlée	x M.Z.6/30	Trianon S.E.	1	1	1	—
Mapou Perlée	x M.Z.1/31	C.E.S.	1	50	38	—
TOTAL ...			15	619	39	52

II. 3RD NOBILISED GLAGAH :

Bambou Rayée	x M.X.3/30	P.E.S.	1	20	—	0
POJ.2364	x BH.10(12)	C.E.S.	2	1	0	—
POJ.2364	x D.109	C.E.S.	2	190	157	—
POJ.2364	x D.109	P.E.S.	1	200	—	111
POJ.2364	x D.109, white	C.E.S.	1	175	135	—
POJ.2364	x D.109, white	P.E.S.	1	285	—	103
POJ.2364	x D.109, str.	P.E.S.	1	224	—	107
POJ.2364	x D.1135	C.E.S.	2	80	62	—
POJ.2364	x DK.74	C.E.S.	1	5	0	—
POJ.2364	x M.28/16	C.E.S.	2	1	0	—
POJ.2364	x M.24/16	C.E.S.	3	125	137	—
POJ.2364	x M.27/16	C.E.S.	1	34	0	—
POJ.2364	x M.27/16	P.E.S.	1	102	—	49
POJ.2364	x M.29/16	C.E.S.	1	5	5	—
POJ.2364	x M.35/17	C.E.S.	2	212	56	—
POJ.2364	x M.13/18	C.E.S.	1	0	0	—
POJ.2364	x M.45/19	C.E.S.	3	290	222	—
POJ.2364	x M.15/20	C.E.S.	1	0	0	—
POJ.2364	x M.12/21	C.E.S.	1	40	32	—
POJ.2364	x M.37/26	C.E.S.	2	236	93	—
POJ.2364	x M.113/26	C.E.S.	1	15	0	—
POJ.2364	x M.88/30	P.E.S.	2	2,500	—	95
POJ.2364	x 87.P	C.E.S.	1	210	131	—
POJ.2364	x 131.P	P.E.S.	1	100	—	70
POJ.2364	x S.C.12(4)	C.E.S.	2	17	0	—
POJ.2364	x S.W.499	P.E.S.	1	55	—	29
55.P	x M.X.15/31	P.E.S.	1	2	—	0
TOTAL ...			39	5,124	1,030	564

2. INTER-SPECIFIC CROSSES—*Continued*

COMBINATION		Location of cross	No. of crosses made	No. of seedlings obtained	No. of seedlings planted in the field C.E.S. P.E.S.	
III. 4TH NOBILISED GLAGAH:						
B.3390	x POJ.2878	C.E.S.	1	1	0	—
B.6308	x POJ.2878	C.E.S.	1	12	0	—
B.7924	x POJ.2878	C.E.S.	1	12	11	—
Ba.11569	x POJ.2878	C.E.S.	1	18	11	—
Ba.11569	x POJ.2878	P.E.S.	1	16	—	10
Bambou Rayée	x POJ.2878	P.E.S.	2	219	—	95
Bambou Rayée	x POJ.2878	C.E.S.	3	41	26	—
BH.10(12)	x POJ.2878	Béga S.E.	2	1	0	—
Bois Rouge	x POJ.2878	C.E.S.	1	20	0	—
H.109	x POJ.2878	C.E.S.	1	20	10	—
H.109	x POJ.2878	P.E.S.	1	26	—	19
Iscambine	x POJ.2878	P.E.S.	1	27	—	12
Louzier	x POJ.2878	P.E.S.	2	73	—	59
Louzier	x POJ.2878	C.E.S.	1	0	0	—
Mapou Perlée	x POJ.2878	C.E.S.	1	1	0	—
M.20/16	x POJ.2878	C.E.S.	3	220	186	—
M.23/16	x POJ.2878	P.E.S.	3	17	—	10
M. 1/17	x POJ.2878	P.E.S.	1	167	—	93
M.33/19	x POJ.2878	P.E.S.	3	916	—	375
M.33/19	x POJ.2878	C.E.S.	2	68	51	—
M.26/20	x POJ.2878	P.E.S.	1	832	—	298
M. 6/22	x POJ.2878	P.E.S.	1	83	—	33
M.14/26	x POJ.2878	P.E.S.				
	and Mon Rocher		2	200	—	85
M.11/29	x POJ.2878	Mon Rocher	1	1	—	1
M.12/29	x POJ.2878	P.E.S.	2	271	—	116
M.14/29	x POJ.2878	P.E.S.	1	10	—	9
POJ.2725	x BH.10(12)	Mon Rocher	3	6	—	4
POJ.2725	x D.109	C.E.S.	1	5	6	—
POJ.2725	x D.109	Mon Rocher	1	0	—	0
POJ.2725	x D. 109, str.	Mon Rocher	1	0	—	0
POJ.2725	x D.1135	Mon Rocher	2	3	—	0
POJ.2725	x D.1135	C.E.S.	3	5	3	—
POJ.2725	x DK.74	Mon Rocher	2	12	—	8
POJ.2725	x Lab. 111/14	C.E.S.	1	1	0	—
POJ.2725	x M.23/16	C.E.S.	1	0	0	—
POJ.2725	x M.27/16	C.E.S.	1	1	0	—
POJ.2725	x M.27/16	Mon Rocher	2	10	—	0
POJ.2725	x M.29/16	C.E.S.	1	1	1	—
POJ.2725	x M.35/17	C.E.S.	2	38	0	—
POJ.2725	x M.35/17	Mon Rocher	1	10	—	5
POJ.2725	x M.13/18	Mon Rocher	1	3	—	0
POJ.2725	x M.37/26	Mon Rocher	1	3	—	0
POJ.2725	x M.109/26	Mon Rocher	2	12	—	3
POJ.2725	x M.170/31	Mon Rocher	1	20	—	19
POJ.2725	x S.C.12(4)	Mon Rocher	1	30	—	27
POJ.2725	x S.C.12(4)	C.E.S.	2	0	0	—
POJ.2725	x Senneville	Mon Rocher	1	18	—	12
POJ.2725	x S.W.499	Mon Rocher	2	2	—	0
POJ.2725	x 55.P	Mon Rocher	1	0	—	0
POJ.2725	x 87.P	Mon Rocher	1	231	—	62
POJ.2725	x 131.P	Mon Rocher	1	1	—	0
POJ.2878	x BH.10(12)	Mon Rocher	6	306	—	217
POJ.2878	x D.109, white					
	Mon Rocher		1	86	—	31
POJ.2878	x D.1135	C.E.S.	3	135	100	—
POJ.2878	x DK.74	Mon Rocher	3	158	—	70
POJ.2878	x DK.74, str.	Mon Rocher	1	111	—	6
POJ.2878	x M.23/16	Mon Rocher	1	27	—	8
POJ.2878	x M.27/16	Mon Rocher	3	238	—	118

2. INTER-SPECIFIC CROSSES—*Continued*

COMBINATION		Location of cross	No. of crosses made	No. of seedlings obtained	No. of seedlings planted in the field	
					C.E.S.	P.E.S.
POJ.2878	x M.29/16	Mon Rocher	1	78	—	46
POJ.2878	x M.35/17	Mon Rocher	2	149	—	94
POJ.2878	x M.13/18	Mon Rocher	1	50	—	88
POJ.2878	x M. 2/19	Mon Rocher	1	124	—	104
POJ.2878	x M. 6/25	Mon Rocher	2	187	—	89
POJ.2878	x M.24/25	Mon Rocher	2	742	—	290
POJ.2878	x M.37/26	Mon Rocher	2	186	—	100
POJ.2878	x M.37/26	C.E.S.	1	20	11	—
POJ.2878	x M.109/26	Mon Rocher	2	302	—	103
POJ.2878	x M.88/30	Mon Rocher	3	2,500	—	90
POJ.2878	x M.170/31	Mon Rocher	1	1,800	—	148
POJ.2878	x 55.P	Mon Rocher	2	83	—	57
POJ.2878	x 87.P	Mon Rocher	2	2,543	—	247
POJ.2878	x 87.P	C.E.S.	1	1,200	455	—
POJ.2878	x 131.P	Mon Rocher	1	90	—	56
POJ.2878	x S.C.12(4)	Mon Rocher	1	309	—	151
POJ.2878	x Senneville	Mon Rocher	2	100	—	61
POJ.2878	x S.W.499	Mon Rocher	3	224	—	130
R.P.6	x POJ. 2878	P.E.S.	1	184	—	88
R.P.6	x POJ.2878	C.E.S.				
	and Ebène S.E.		7	653	474	—
R.P.8	x POJ.2878	Beau Bassin				
	and Ebène S.E.		6	370	401	—
55.P	x POJ.2878	P.E.S.	3	709	—	294
131.P	x POJ.2878	C.E.S.	2	2,000	379	—
Total ...			143	19,899	2,125	3,941

IV. 5TH NOBILISED GLAGAH :

Ba.11569	x POJ.2940	C.E.S.	2	110	87	—
Bambou Rayée	x POJ.2940	P.E.S.	1	239	—	179
H.109	x POJ.2940	C.E.S.	1	95	56	—
M.20/16	x POJ.2940	C.E.S.	1	0	0	—
M. 1/17	x POJ.2940	C.B.S.	1	125	90	—
Total ...			6	569	233	179

V. OTHER SPONTANEUM COMBINATIONS :

POJ.2364	x POJ.2878	C.E.S.	3	40	28	—
POJ.2364	x POJ.2940	C.E.S.	2	11	9	—
POJ.2725	x Glagah Djatirotto	C.E.S.	1	600	0	—
POJ.2878	x POJ.2940	C.E.S.	2	150	92	—
Total ...			8	801	129	—

VI. SINENSE CROSSES :

Ba.11569	x Uba Marot	C.E.S.	1	20	18	—
Ba.11569	x Uba Marot	P.E.S.	1	25	—	8
Bambou Rayée	x Uba Marot	P.E.S.	1	326	—	180
BH.10(12)	x Uba Marot	Mon Rocher	1	128	—	62
B.H.10(12)	x Uba Marot	Beau Bassin				
	and Béga S.E.		2	56	43	—
Bois Rouge	x Uba Marot	C.E.S.	2	159	94	—
H.109	x Uba Marot	C.E.S.	1	8	8	—
Louzier	x Uba Marot	P.E.S.	1	48	—	23

2. INTER-SPECIFIC CROSSES—*Continued*

COMBINATION		Location of cross	No. of crosses made	No. of seedlings obtained	No. of seedlings planted in the field	
					C.E.S.	P.E.S.
Mapou Perlée	x Uba Marot	C.E.S.	1	0	0	—
M. 1/17	x Uba Marot	P.E.S.	1	440	—	180
M. 3/17	x Uba Marot	P.E.S.	1	33	—	18
M.109/26	x Uba Marot	P.E.S.	3	2,353	—	244
M. 12/29	x Uba Marot	P.E.S.	1	0	—	0
M. 14/29	x Uba Marot	P.E.S.	1	0	—	0
M. 14/32	x BH.10(12)	Mon Rocher	1	0	—	0
R.P.6	x Uba Marot	Mon Rocher	1	23	—	0
R.P.8	x Uba Marot	Beau Bassin	2	330	222	—
R.P.8	x R.F. No. 2	Ebène S.E.	4	1	0	—
55.P	x Uba Marot	P.E.S.	1	54	—	22
Uba	x BH.10(12)	C.E.S.	1	0	0	—
Uba	x M.35/17	C.E.S.	1	0	0	—
Total ...			29	4,004	385	737

VII. OTHER COMBINATIONS :

B.6308	x Selangor					
	Seedling	C.E.S.	1	1	0	—
Ba.11569	x Selangor					
	Seedling	C.E.S.	1	0	0	—
Ba.11569	x M.22/29	P.E.S.	1	0	—	0
Ba.11569	x POJ.161	P.E.S.	1	202	—	104
Bambou Rayée	x POJ.161	P.E.S.	1	356	—	146
Bambou Rayée	x Seed.1843/32(2)	P.E.S.	1	21	—	0
Fotiogo	x Selangor					
	Seedling	C.E.S.	1	1	0	—
H.109	x Selangor					
	Seedling	C.E.S.	1	0	0	—
H.109	x M.108/30	C.E.S.	1	0	0	—
Louzier	x Selangor					
	Seedling	C.E.S.	1	0	0	—
M. 12/16	x Seangor					
	Seedling	C.E.S.	1	0	0	—
M. 1/17	x POJ.161	C.E.S.	1	94	72	—
M. 2/29	x M. 27/16	Mon Rocher	1	5	—	0
M. 2/29	x M.109/26	Mon Rocher	1	0	—	0
M.106/30	x BH.10(12)	C.E.S.	4	0	0	—
M.106/30	x D.109	C.E.S.	1	0	0	—
M.106/30	x D.1135	C.E.S.	2	1	1	—
M.106/30	x DK.74	C.E.S.	3	0	0	—
M.106/30	x M.27/16	C.E.S.	3	0	0	—
M.106/30	x M.35/17	C.E.S.	1	0	0	—
M.106/30	x POJ.2878	C.E.S.	3	3	2	—
M. 26/31	x DK.74	Ebène S.E.	1	20	0	—
M. 26/31	x M.109/26	Ebène S.E.	1	1	0	—
M. 14/32	x POJ.2878	Mon Rocher	1	224	—	84
POJ.213	x POJ.2878	C.E.S.	1	70	0	—
POJ.2364	x POJ.161	C.E.S.	1	500	93	—
POJ.2364	x Uba Marot	C.E.S.	2	2,500	375	—
POJ.2364	x Uba Marot	P.E.S.	1	500	—	91
POJ.2725	x Uba Marot	Mon Rocher	1	290	—	99
POJ.2878	x Uba Marot	C.E.S.	2	6,200	216	—
POJ.2878	x Glagah Djatiroto					
	Mon Rocher		1	1,800	—	50
POJ.2878	x POJ.2940	Mon Rocher	1	996	—	351
POJ.2878	x Uba Marot	Mon Rocher	2	5,351	—	270
R.P.6	x M. 2/29	Mon Rocher	1	16	—	8

2. INTER-SPECIFIC CROSSES—*Continued*

COMBINATION		Location of cross	No. of crosses made	No. of seedlings obtained	No. of seedlings planted in the field	
					C.E.S.	P.E.S.
R.P.6	x M.108/30	C.E.S.	1	0	0	—
R.P.6	x M. 9/32	Mon Rocher	1	14	—	0
R.P.6	x Selangor					
	Seedling	Mon Rocher	1	27	—	16
R.P.8	x M. seedg./31	(1) Beau Bassin				
		and Ebène S.E.	2	33	23	—
Uba	x POJ.2878	C.E.S.	5	2	0	—
Uba	x POJ.2940	C.E.S.	1	0	0	—
Uba	x Selangor					
	Seedling	C.E.S.	1	1	0	—
M.seedg.10734/32	x M.Seedg.10665/32					
		C.E.S.	1	0	0	—
(2) M.seedg.10823/32	x MZ.8/30	C.E.S.	1	0	0	—
(2) M.seedg.10823/32	x MZ.7/31	C.E.S.	1	0	0	—
(3) M.seedg.1119/33	x D.109, str.	Mon Rocher	1	0	—	0
(3) M.seedg.1179/33	x DK.74	Mon Rocher	1	0	—	0
(3) M.seedg.1179/33	x Uba Marot	Mon Rocher	1	0	—	0
(3) M.seedg.1189/33	x 131.P	Mon Rocher	1	0	—	0
(3) M.seedg.1210/33	x Seneville	Mon Rocher	1	1	—	0
(3) M.seedg.1264/33	x D.109.white					
		Mon Rocher	1	0	—	0
(2) M.seedg.1843/33	x D.109, white					
		Mon Rocher	1	7	—	0
POJ.2364	x S. Munja	C.E.S.	1	0	0	—
POJ.2364	x Selangor					
	Seedling	C.E.S.	2	581	429	—
Total ...			72	19,818	1,211	1,219
Interspecific crosses :			Total ...	312	50,834	5,152
						6,592

3. INTERGENERIC CROSSES.

M.20/16	x Arundo					
	Bengalensis	C.E.S.	1	0	0	—
M.33/19	x Arundo					
	Bengalensis	C.E.S.	1	0	0	—
POJ.2364	x Sorghum	C.E.S.	1	0	0	—
Total ...			3	0	0	—

4. C.E.S., P.E.S., AND OTHER SEEDLINGS.

551.P—Ba.11569	x M.109/26	P.E.S.	—	—	150	—
619.P—Bambou						
	Rayée	x S.C.12(4)	P.E.S.	—	232	—
623.P—55.P	x POJ.2878	P.E.S.	—	—	195	—
981.R—131.P	x POJ.2878	C.E.S.	—	—	—	31
672.P—M. 1/17	x S.C.12(4)	P.E.S.	—	—	291	—
561.P—M.109/26	x POJ.2878	P.E.S.	—	—	39	—

(1) POJ.2878 x Uba Marot. (2) 131.P x S. Munja. (3) POJ.2878 x Sorghum.

4. C.E.S., P.E.S., AND OTHER SEEDLINGS—*Continued*

COMBINATION			Location of cross	No. of crosses made	No. of seedlings obtained	No. of seedlings planted in the field	
						C.E.S.	P.E.S.
540.P—M.109/26	x	Uba Marot	P.E.S.	—	—	189	—
693.P—M. 12/29	x	POJ.2878	P.E.S.	—	—	0	—
698.P—M. 12/29	x	S.C.12(4)	P.E.S.	—	—	0	—
490.P—POJ.2364	x	M. 86/30	P.E.S.	—	—	181	—
549.P }	POJ.2878	x M.109/26	P.E.S.	—	—	17	—
656.P }							
541.P—POJ.2878	x	M.170/31	P.E.S.	—	—	231	—
648.P—R.P.6	x	S.C.12(4)	P.E.S.	—	—	270	—
982.R—R.P.8	x	POJ.2878	C.E.S.	—	—	—	107
983.R—R.P.8	x	POJ.2878	C.E.S.	—	—	—	135
985.R—R.P.8	x	DK.74	C.E.S.	—	—	—	135
988.R—R.P.8	x	DK.74	C.E.S.	—	—	—	40
987.R—R.P.8	x	M.27/16	C.E.S.	—	—	—	121
1071.R—R.P.8	x	M.13/18	C.E.S.	—	—	—	0
G.B.10			Gros Bois	—	—	330	—
G.B.11—M.7/23	x	G.B. seedling x 32	Gros Bois	—	10	0	—
H. 51—23.3950	x	31.1236	Hawaii	—	0	0	—
H. 60—29.5321	x	31.2476	Hawaii	—	0	0	—
H. 80—POJ.2878	x	23.3950	Hawaii	—	5	1	—
H. 90—28.1227	x	Onomea	Hawaii	—	10	6	—
H.2518—H.109	x	POJ.2878	Hawaii	—	15	14	—
Total ...			—	—	40	2,146	569

5. SELFINGS.

VARIETY			Location	No. of selfings made	No. of seedlings obtained	No. of seedlings planted in the field	
						C.E.S.	P.E.S.
M.12/29		...	... P.E.S.	1	11	—	10
M.14/29	...	...	... P.E.S.	1	5	—	3
Seedg.No. B.3/32*	...	...	... P.E.S.	1	42	—	21
Seedg.4105/32*	...	...	... P.E.S.	1	0	—	0
Seedg.4106/32*	...	...	... P.E.S.	1	30	—	17
Total ...			—	5	88	—	51

6. RECAPITULATION TABLE.

CROSS			No. of crosses and selfings made	No. of seedlings obtained	No. of seedlings planted in the field	
					C.E.S.	P.E.S.
I—Crosses between “ Noble ” canes	...	...	101	43,143	1,721	2,488
II—Interspecific Crosses	...	...	312	50,834	5,152	6,692
III—Intergeneric Crosses	...	...	3	0	0	0
IV—C.E.S., P.E.S., and other seedlings	...	...	—	40	2,146	569
V—Selfings	...	...	5	88	—	51
Total			421	94,105	9,019	9,800

* Uba Marot selfed.

PART II—BIO-CHEMISTRY

BY N. CRAIG, M. SC.

As in previous years, the chief work of this division has been to continue the examination of the properties of local soils, and to carry out manurial trials on estates in different parts of the island. The soil work has included investigations into the chemical, physical and microbiological processes in the different soil types, all of which are discussed briefly in the first part of this report. The second part consists of the results obtained from the manurial trials, of which fourteen were reaped during the crop season of 1934.

SOILS

BASE EXCHANGE CAPACITY OF SOILS.

In the general examination of soils, it was seen that the soils of the most highly leached areas possessed the power of absorbing bases to a less degree than did those of the slightly leached areas. The total base exchange capacity by the neutral ammonium acetate method is dependent upon several factors however, which may be briefly enumerated as follows: (1) the amount of the inorganic colloid (clay); (2) the amount of the organic colloid (humus); (3) the character of the clay; (4) the character of the humus. With the figures available it was not possible to calculate the base exchange capacity of the various fractions, and consequently more experiments have been performed with the object of elucidating the problem.

The general scheme was to destroy the organic matter, and afterwards to determine the base exchange capacity of the inorganic matter remaining. Originally the organic matter was destroyed by boiling with hydrogen peroxide, but on account of the extreme slowness of the subsequent filtration processes, this method was abandoned, and the organic matter was destroyed by heating to 350°C to 400°C for eight hours (J. Mitchell, Journ. Amer. Soc. Agron., 1932, p. 256). In order to see whether this prolonged heating had any effect upon the exchange capacity of the clay, the first samples analysed consisted of four profile samples from a pit at the Central Experiment Station. It was found that the total base exchange capacity of the three subsoil samples, which contained only very small amounts of organic matter remained practically the same after the treatment as before, so that it was assumed that heating to 350°–400°C had not materially affected the base exchange capacity of the clay fraction.

Subsequently three representatives of each of the following types were analysed by this method:

Mature Soils

Highly laterised
Medium degree of laterisation
Low degree of laterisation

Immature Soils

High degree of laterisation
Low degree of laterisation

Two further samples were included and these were grey soils from a marshy area on Medine S.E. and from "Vallée des Prêtres." Analytical data are not being presented in this Report, for the sake of brevity, but the main results are discussed below.

From the figures obtained it is seen that the base exchange capacity of the inorganic absorbing complex (clay) varies greatly in the different types of soils. In the mature soils, the clay from the most highly laterised samples

has an extremely low capacity for base exchange, but that as the degree of laterisation decreases, so this capacity increases. Allowing, however, for experimental errors, the exchange capacity of the organic absorbing complex (humus) remains practically the same in all the mature soils. Briefly then, it may be stated that in the highly laterised mature soils, the clay exerts a very minor influence on the base exchange properties of the whole soil, the predominating influence being that of the organic matter, which, weight for weight, can absorb approximately twenty times more bases than the clay. It will thus be appreciated that without a fairly abundant supply of organic matter, these highly laterised soils would very readily lose the bases, such as potash, applied to them. Again in these districts, the acidity of these soils will be due chiefly to the organic matter and not to the clay. A very different state of affairs, however, is noticed with regard to the mature soils with a low degree of laterisation, i.e. the red soils. The exchange capacity of the clay is more than double of that in the highly laterised zones, and at the same time the percentage of clay is considerably higher in the former than in the latter ; consequently we find in these soils that the inorganic fraction becomes as important as the organic fraction in base exchange relationships.

A consideration of the figures obtained with the immature soils, however, shows that whilst those from the highly laterised regions seem to agree with those of the mature soils, those from the slightly laterised regions show very great differences, the total base exchange capacity of the organic matter being in the region of 400 milligram equivalents%, whilst for the remainder it lay in the neighbourhood of 250 m.eqs.%. The grey soils were similar to these immature rocky soils of the dry districts in this respect. The question therefore naturally arose as to whether the treatment (heating to 350°-400°C for 8 hours) was adversely affecting the base exchange capacity of the clay fraction. Consequently yet another method of destroying the organic complex was tried, namely treating 5 grs. of soil with 2.5 ccs. of 20% ammonium nitrate solution and heating to 250°C, and then repeating this treatment once again. One soil from each group was tested by means of this method, and whilst the results obtained for all the mature soils and for the highly laterised immature soils remained practically the same as those obtained by the former method, the results with the immature soils of the dry regions and with the grey soils differed greatly, in that the exchange capacity of the clay was very much higher, and that this capacity of the organic matter was about the same as for the other categories of soils. We are thus in a position to suggest that the base exchange capacity of the organic fraction of the mature soils, the immature soils and of the grey soils would appear to be fairly constant, around 250 m.eqs.% organic matter, but that this property of the clay fraction varies greatly in soils of the different categories. Thus in the mature soils, passing from the wet to the dry regions it increases from about 13 m.eqs.% clay to about 25 m.eqs.% clay and in the immature soils from about 21 m.eqs.% clay to about 70 m.eqs.% clay, whilst for the Médine grey soil it amounts to no less than 96 m.eqs.% clay.

As a result of this work it may be stated that the mineral base exchange capacity of the inorganic colloids $< 2\mu$ varies greatly, being very low for the laterites and very high for the grey soils. On the other hand, the exchange capacity of the organic matter remains fairly constant in all types of soil. In other words, increased leaching results in destruction of the mineral base exchange complex, without affecting to any large extent the organic complex.

THE PHOSPHATE STATUS OF MAURITIUS SOILS

The question of the phosphorus content of soils is an extremely important one, especially in lateritic soils, in view of the very marked power which they have of fixing added phosphates. This power has already been demonstrated, and the results briefly described in the Fourth Annual Report of the Sugarcane Research Station. It has also been seen from the results published in Bulletin No. 4 of this Station, that whereas in general the available P_2O_5 as determined by Dyer's and Truog's methods agree very well, in certain types of soils wide divergencies occur. These differences were especially marked in the case of highly laterised immature soils which contain relatively high amounts of organic matter. In view of this it was considered that the variation might be due to organic forms of phosphorus, which are not acted on by Truog's reagent but which are by means of 1% Citric acid.

Consequently a number of these soils giving different results by the two methods were heated to $350^\circ C$ for 8 hours in the presence of magnesium nitrate (free from As and P) in order to destroy the organic matter and fix the phosphoric oxide as a magnesium salt. The Truog determinations on the treated soil were then carried out as before, and the results obtained are given in Table I.

TABLE I

Soil No.	P_2O_5 by Truog's Method		P_2O_5 by Dyer's Method	pH	Organic matter
	Untreated	Treated			
29	0.0004	0.0031	0.0030	5.95	9.1
39	0.0005	0.0089	0.0066	6.0	6.8
41	0.0004	0.0036	0.0029	5.95	9.3
46	0.0004	0.0032	0.0049	5.65	10.5
90	0.0082	0.0101	0.0040	6.85	7.6
104	0.0026	0.0056	0.0035	6.4	7.0

The results indicate that by destroying the organic complex in these immature highly leached soils, the P_2O_5 extracted by Truog's reagent becomes approximately equal to that extracted by the 1% citric acid from the untreated soil. Consequently it would seem that by the former method only inorganic easily available P_2O_5 is determined whereas by Dyer's method, organic soil phosphorus is also determined.

The possibility still remained, however, that Truog's reagent may have removed the organic phosphorus from the soil, but that the colorimetric determination on the extract was unaffected by phosphorus in this form. Consequently the clear extract was evaporated to dryness with magnesium nitrate so that any organic phosphorus would be converted to the inorganic form, and the residue then dissolved in acid, and the phosphates then determined. The results obtained were practically the same as the original ones by Truog's method, and thus we see that Truog's reagent does not extract organic phosphorus from the soils. In the immature soils from the dry regions, however, it is seen that the P_2O_5 determined by the ordinary Truog's method may be higher than that by Dyer's method, but in spite of this the amount is increased by means of slight ignition with magnesium

nitrate. Thus in the more acid soils, where exchangeable bases are not very plentiful, it would seem that there is a tendency for phosphoric acid to be fixed in the organic form, but in the more nearly neutral soils, where exchangeable bases are plentiful, the phosphoric acid tends to be associated with these bases, calcium being the most probable one.

The availability of organic phosphates for plant growth is a question still open to discussion, some authors reporting that it is not available, whilst others report the converse.

PHYSICAL PROPERTIES AND MOISTURE RELATIONSHIP

In view of the fact that the physical properties are among the most fundamental and important properties of soils, some of them were determined by means of the method described by Keen and Raczkowski (*Journ. Agric. Science*, Vol. XI., Pt.4., p. 441). These determinations were made on the finely powdered soil which passed through the 100 mesh sieve, care being taken not to crush the sand particles. Consequently these figures are not strictly applicable to the whole soil, especially in the case of the highly laterised soils 25, 45 and 92, and of the rocky soils 59, 78 and 90. These determinations are given in Table II, rows 1 to 5.

The crushing force was determined by use of the simple instrument illustrated on p. 80, "*Guide pour l'étude expérimentale du sol*," by A. Demolon and D. Leroux. The block of soil (dried at 105°C) was taken from the Keen-Raczkowski box and placed on the bench with the 15° wedge, 16 m/ms wide in the centre of the block; weights were added to the pan until the block of soil was split in two. Under these conditions the splitting was sudden, the wedge failing to penetrate the block until the critical pressure was reached. These results are given in row 6 of Table II.

The remaining moisture relationships were determined by the methods given in the Appendix to Soils by G. W. Robinson.

TABLE II
PHYSICAL PROPERTIES AND MOISTURE RELATIONSHIP OF SELECTED MAURITIUS SOILS

Soil No.	25	45	92	21	35	87	65	71	77	59	78	90
1. Wt. of Unit vol. (100 ccs.)	116.5	112.4	108.1	—	119.8	108.3	104.4	107.0	108.3	119.6	105.5	107.0
2. H ₂ O taken up by unit wt.	0.623	0.678	0.714	—	0.641	0.699	0.692	0.709	0.733	0.651	0.759	0.817
3. Pore space	...	59.3	62.9	63.3	—	60.8	62.4	62.3	63.7	62.9	63.8	65.6
4. True Sp. Gr.	...	2.34	2.45	2.47	—	2.48	2.38	2.38	2.48	2.40	2.32	2.37
5. Vol. Exp. of unit vol.	...	12.41	12.90	11.09	—	12.71	10.52	10.56	12.38	14.13	12.37	17.0
6. Crushing Force, Grs.	...	583	1,060	4,600	—	1,600	9,500	> 12,000	> 12,000	4,800	6,670	2,400
7. H ₂ O at sticky point	...	40.0	42.2	44.9	49.1	46.8	46.7	44.1	48.6	44.4	43.6	49.8
8. H ₂ O at lower plastic point	...	38.2	40.0	38.1	41.4	42.3	40.1	33.9	36.3	32.9	36.6	40.2
9. H ₂ O at upper plastic point	...	49.4	50.1	56.9	64.9	60.0	68.3	68.6	72.8	58.5	54.0	67.6
10. Range of plasticity	...	11.2	10.1	18.8	23.5	18.7	28.2	34.7	36.5	25.6	17.4	27.4
11. Non-sticky plastic range	...	1.8	2.2	6.8	7.7	4.5	6.6	10.2	12.3	11.5	7.0	9.6

Possibly on account of the relatively small number of determinations, no very definite relationships can be discovered with the Keen-Raczkowski values, although the weight of air dry soil per unit volume and the volume expansion of unit volume tend to decrease as the degree of laterisation decreases, whilst the amount of water taken up by unit weight and the Pore Space possibly increase as the degree of laterisation decreases.

The force necessary to split the oven dried blocks shows quite important differences however, between the extreme types of the mature soils, the yellow soils splitting when only small forces are applied, whereas the red soils failed to show any signs of splitting even under a force of 12 kilogrammes (the maximum obtainable with the apparatus available). This shows the extremely friable nature of the highly laterised soils, which, even in prolonged droughts when the top soil may dry out considerably, should be comparatively easy to work. In the case of the red soils, however, there will be a tendency for them to become very hard during dry periods with the result that they will be difficult to work and they will also offer increased resistance to the passage of the roots of plants growing in such soils. As indicated above, the volume expansion seems to be greater in the yellow than in the red, and consequently other properties being equal there would be a greater tendency for the former to crack on drying. However the friable nature of these soils probably counteracts this tendency.

The moisture content at the sticky point is generally considered as having a definite significance, in that at this point the soil gels are completely saturated with water. The soil gels consist of both organic and inorganic fractions, of which the organic matter is the more important, weight for weight. The soil at the lower plastic limit (Atterberg) breaks down into crumbs on rolling, whilst at the upper plastic limit of Atterberg (otherwise the lower liquid limit of Bennett and Allison) the soil mass begins to flow under slight vibration. Between these two limits, however, the soil is plastic and may be moulded into blocks which retain their shape. Soils in the natural state rarely, if ever, contain water contents as high as those shown at the upper plastic limit, whereas the water contents at the sticky point approximate to the maximum moisture contents found in the field, although the water in the two cases is probably held differently. The Atterberg plasticity index is the difference between the moisture contents at the lower and upper plastic limits. Bodman and Perry (*Soil Science* XXXI, 1931., p. 368) suggest the use of the non-sticky plastic range, which is the difference between the moisture contents at the lower plastic limit and the sticky point as being of more value. Both the figures for plasticity index and the non-sticky plastic range show however variations of a similar nature: according to these figures the free soils become less plastic as we pass from the red soils to the yellow soils, i.e. as the degree of laterisation increases. It is thus seen that the red soils are definitely of a more plastic character than are the yellow ones, but the stability of the soil crumbs, as has been shown in a previous report (4th Annual Report, Sugarcane Research Station) is so great that there would be little likelihood of destroying the soil structure even if cultivation operations were conducted during the time when the soil was in the plastic range likely to be encountered in practice. It is seen that the moisture contents at both the sticky point and the lower plastic limit increase on passing from the highly laterised soils to the intermediate ones, and falls again in the least laterised ones.

This is probably due to the fact that the three representatives of the intermediate range are richer in organic matter than soils of this range normally are. When these figures are compared with those given by Bodman and Perry (Soil Science XXXI, 1931, p. 365), it will be seen that the moisture contents are definitely higher in the local soils.

NITRIFYING POWER OF MAURITIUS SOILS.

Whilst the general properties of Mauritius soils were being determined, it was seen that the amount of nitrogen present in the organic form was fairly high, the content generally falling between 0.2% and 0.5% of the oven dry soil. Doubt has often been expressed, however, as to the value of this organic nitrogen to the growing plant, and consequently nitrification studies have been started with a view to trying to elucidate this point.

The experiments so far conducted fall within two groups: first to find whether there is any intrinsic difference between the soils of different types, and secondly, to find whether the rate of nitrification may be influenced by means of mineral applications.

First Series of Experiments.—

The locations of the soils chosen for these experiments, together with some of their properties are given in Table III.

TABLE III
ALL RESULTS EXPRESSED ON OVEN DRY WEIGHT

Locality	Moisture at sampling %	Organic Nitrogen %	Organic carbon %	Nitrogen in form of ammonia m/grs. per kilog.	Nitrogen in form of Nitric acid m/grs. per kilog.	pH	Bacteria per gr. in millions
1. La Ferme Tobacco Station	... 17.2	0.37	3.40	4.5	11.2	6.95	2.7
2. Richelieu	... 23.3	0.25	2.89	0.0	6.3	6.95	2.6
3. Minissy	... 37.5	0.23	2.52	0.0	19.5	5.35	3.9
4. Réduit	... 31.4	0.30	2.90	1.1	26.9	6.0	2.6
5. Hermitage	... 34.6	0.16	2.80	1.1	10.6	5.75	3.8
6. Bar-le-Duc	... 44.9	0.27	3.59	0.6	20.7	5.3	7.1

The first two soils are from the red soil areas of Black River district, whilst the last two are soils of the highly laterised regions, the whole six being mature soils, free from stones and gravel. It will be seen that the C/N ratio becomes wider as we pass from the drier to the wetter districts. The reason for the relatively small number of bacteria present in the soil from La Ferme, Richelieu and Réduit may possibly be accounted for by the low moisture contents. The amount of mineral nitrogen present does not bear any close relationship with the total number of bacteria, as the Réduit soil, with the smallest number of bacteria contains the highest amount of nitrogen in the ammoniacal and nitric forms.

Furthermore, it will be noticed that, except in the case of the La Ferme soil, there is little or no accumulation of ammoniacal nitrogen present, showing that the conversion of ammonia into the nitric form is quicker than the conversion of organic nitrogen into the ammoniacal form.

The experiments were carried out in glass breakers, each experiment being done in duplicate, according to the plan given in Table IV.

TABLE IV
PLAN OF THE EXPERIMENTS

No. of Treatment	Treatment
b. ...	No addition to the soil, in order to follow the nitrification of the original soil nitrogen.
c. ...	30 m/grs. of nitrogen as sulphate of ammonia added per 100 grs. dry soil.
d. ...	30 m/grs. of nitrogen as sulphate of ammonia and 210 m/grs. calcium carbonate added per 100 grs. dry soil
e. ...	1 gr. of finely ground dried cane leaves added per 100 grs. dry soil.

The amounts of ammoniacal and nitric nitrogen in the variously treated soils were determined by the method of Carsten Olsen at intervals of 32 and 75 days. No attempt was made to keep the soils at constant temperature, but their moisture content was kept near the optimum by additions of distilled water every three days. The beakers were kept in a box in a greenhouse, so that the results are strictly comparable. It is not intended to give tables of detailed results in this report, as the whole question will be discussed more fully when all the series of experiments are concluded. The following observations may however be made on the results so far obtained.

In the (b) series, the pH value remained practically constant during the course of the experiments. The rate of nitrification was approximately equal in all soils, the rate in soil 4 being somewhat above and in soil 2 somewhat below the average. There was no accumulation of mineral nitrogen in the form of ammonia, thus showing that the limiting factor in the production of nitrates from organic nitrogen is the step resulting in the formation of ammonia.

The (c) series, in which ammonium sulphate is nitrified without simultaneous applications of calcium carbonate, supplies information, according to Waksman, on the buffer content of the soils. In every case a considerable lowering of pH value occurred; this is due to the neutralising of soil bases by the SO_4 ion in the sulphate of ammonia and by the nitric acid produced as a result of the nitrification of the NH_4 ion. This lowering of pH, which took place chiefly in the first 32 days, would probably not take place to the same extent under natural conditions. In the more nearly alkaline soils, most of the ammonia had been converted into nitric acid in the shorter period, but in the more acid soils (3, 5 and 6) only about 50% has been nitrified in 32 days, and during the subsequent period of 48 days little change had occurred. This indicates that under the more acid conditions there is a definite limit to the conversion of ammonia into nitric acid.

A better test for the nitrifying power of soils however is the (d) series, in which the theoretical amount of calcium carbonate is added to neutralise any acids formed from the ammonium sulphate. That this amount added has been sufficient to achieve its object is shown by the fact that the pH values of the series both after 32 and 75 days are approximately the same as those for the original soils. In this series also, it is seen that the rate of nitrification is greater in the more alkaline soils (1, 2, 4) than in the more acid ones (3, 5 and 6), in that the latter still contain a considerable amount of ammonia after 32 days. After 75 days, however, there is practically no ammonia in any of the samples, with the exception of soil 6. This shows that where soils from the different districts are placed in similar conditions, the more alkaline soils of the drier districts are more efficient for rapid nitrification.

The (d) series, to which 1% finely ground cane trash was added, is of great interest. The addition of this carbonaceous material has resulted in a complete cessation of nitrate production for the first 32 days, and even after 75 days nitrates are only found in two cases and then only in relatively small quantities, the nett result being a reduction in mineral nitrogen after an interval of 75 days of from 75% to 95% of the amount present in the untreated soil. It must be remembered that the straw was added in a finely comminuted form and that conditions were kept as near the optimum as possible, so that the fact that the depression of the nitrification processes has lasted for a period of two and a half months becomes a serious factor. In the fields when trash is buried, large quantities of long straw are buried in a trench in the interline, so that it is not likely the initial phase of its decomposition will be complete for a very considerable time. When the trash is added to the soil it has a very wide C/N ratio and during the initial phase of its decomposition, the C/N ratio gradually becomes closer by the action of micro-organisms, which require nitrogen from external sources, such as ammonia or nitrates in the soil, during this time. When this ratio becomes sufficiently close (approximately 15/1) then the further decomposition results in the production of mineral nitrogen.

The results of "in vitro" experiments are not however strictly applicable to the field, but the effect of addition of trash in this beaker experiment is considered sufficiently important to justify the continuation of this work. In one block of canes at the Central Experiment Station, trash was buried in every alternate interline in September 1933, and this plot is forming the subject for further research. Samples have been taken from all interlines in June 1934; at the time of sampling, there was no significant difference between the amounts of mineral nitrogen in the lines where trash had been buried and where it had not. Experiments were conducted "in vitro" to determine whether there was any difference in nitrifying power, both as regards original soil nitrogen and added sulphate of ammonia.

The results obtained show that in so far as original soil nitrogen is concerned, the soil in which trash was not buried has a higher nitrate content at the end of 35 days than has that in which trash was buried, the amount of ammonia being about the same. The most interesting point, however, is that in the samples to which sulphate of ammonia was added, the soils in which the trash was buried were the more efficient for nitrifying, as at the end of the 35 days during which the experiment was conducted nearly 90% of the mineral nitrogen was present in the nitrate form, whereas in the soil where trash was not buried only about 55% was present in that state. In all the beakers to which sulphate of ammonia was added there has been a loss of mineral nitrogen, amounting to 15% where straw was not buried, and 21% where it was. Whether this loss is due to reversion to the organic forms or to the production of gaseous nitrogen is not known.

Second Series of Experiments.—The examination of the soils from various localities has shown that the soils of the wetter and therefore more highly leached areas are characterised by low pH values, low exchangeable potassium and low available phosphate contents. Micro-organisms, like the higher plants, have an optimum pH value and they also require certain concentrations of these plant food materials for optimum growth. In order to determine the influence of these factors on the nitrification processes, two soils from the highly leached areas were sampled, one from Hermitage S.E. and the other from Alma (Bar-le-Duc) S.E. In the former of these, the nitrification of the nitrogen

originally present in the soil was determined, as well as the nitrification of added organic nitrogen in the form of blood albumen. Each test was done in duplicate. Blood albumen was added to all the tests with the Alma soil, each experiment being done in quadruplicate. The plan of the experiment is given in Table V.

TABLE V

PLAN FOR SECOND SERIES OF EXPERIMENTS.

1. Soil untreated.
2. Soil + 1% CaCO_3 + 0.05% K_2SO_4 + 0.1% mono-acid calcium phosphate.
3. Soil + 0.05% K_2SO_4 + 0.1% mono acid calcium phosphate.
4. Soil + 1% CaCO_3 + 0.1% mono-acid calcium phosphate.
5. Soil + 1% CaCO_3 + 0.05% K_2SO_4 .

Discussion of Results with the Hermitage Soil.

The lime added to Treatments 2, 4 and 5 was sufficient to raise the pH value of this soil to approximately 7.4 and the mono-acid calcium phosphate has had no effect upon the pH value. So far as the original soil nitrogen is concerned, all the soils to which calcium carbonate was added showed very definite increases in nitrates over those to which none had been added. There was, however, practically no difference between the limed soils, which seems to indicate that the applications of phosphatic and potassic fertilisers have been without effect on the rate of nitrification.

In the experiments to which blood albumen was added, the amount of mineral nitrogen (ammoniacal + nitrate nitrogen) was approximately the same in all treatments, but in the untreated soil about one-third of the mineral nitrogen was in the form of ammonia at the end of 32 days, whereas in the others it was all in the form of nitrates, so that it would seem that both potash and phosphates and possibly also the available calcium in the phosphatic fertilisers, have resulted in the speeding up of the change from ammonia to nitric acid. At the end of 75 days, the same difference persisted in the nitrification of the original soil nitrogen. In the samples to which albumen was added, all the mineral nitrogen was in the form of nitrates, but in slightly less amount in the soil to which no lime or fertilisers had been applied.

Discussion of Results with the Soil from Alma (Bar-le-Duc).

To all these experiments, blood albumen was added, so that no information can be obtained about the nitrification of the original soil nitrogen, but the results for the albumen series are more reliable, since they are means of experiments carried out in quadruplicate. As with the previous soil, the total mineral nitrogen in the five series at the end of 32 days is practically the same, and again in series 1, about 25% of the mineral nitrogen is in the form of ammonia, whereas in all the others there is very little, so that the results with this soil confirm those obtained with that from Hermitage. Even in Series 3, to which potash, phosphates and available calcium were applied with the pH value remaining the same as in the untreated soil, the change from ammonia to nitric acid has been speeded up and it may be that the action the organisms bringing about this change is being limited by the lack of these substances. At the end of 75 days, the time factor has become so great, that in none of the series is there any accumulation of ammonia, and the amount of nitric acid is practically the same throughout.

NITRIFICATION EXPERIMENTS WITH SOIL AND SUB-SOIL MIXTURES

It has been stated that Mauritius subsoils are toxic, and in order to try to find out whether the mixing of subsoil with surface soil has any depressing effect upon the nitrification processes, experiments were conducted "in vitro." Four mixtures were prepared as follows :

A	...	...	100% surface soil.
B	...	...	90% surface soil + 10% sub-soil.
C	...	...	50% surface soil + 50% sub-soil.
D	...	...	100% sub-soil.

Four treatments were tried with each of these mixtures : (1) no treatment ; (2) 30 mgrs. sulphate of ammonia per 100 grs. dry soil + necessary amount of CaCO_3 ; (3) blood albumen at the rate of 0.2% ; (4) powdered pen manure at the rate of 1%.

From the results obtained it will be seen that mixtures A and B give results which are almost certainly not significantly different. In series (1) all mixtures contain about the same amount of mineral nitrogen, but A and B contain a higher proportion in the form of nitrates. In the series to which sulphate of ammonia was added, it was found that the rate of nitrification was highest in mixture A, slightly lower in mixture B, distinctly so in C and lowest of all in D. In the 3rd series, the production of mineral nitrogen and of nitric nitrogen is distinctly higher in groups A and B than in groups C and D. In the 4th series, the production of mineral nitrogen is about the same in all groups, but again the proportion of nitric nitrogen falls from the A and B groups to the C and D groups.

Thus we see that A and B groups are approximately even, so that the admixture of 10% sub-soil with the surface soil has no deleterious effect upon the soil micro-organisms. Even with the larger proportion of subsoil, the nitrification processes are not suppressed, so that as far as soil micro-organisms are concerned, it must be concluded that the sub-soils are not toxic, but merely sterile, and the depression of the nitrification processes is due to dilution of the active surface soil with the sterile sub-soil.

MANURIAL TRIALS

During the crop season of 1934, fourteen manurial trials were reaped in various parts of the Island ; of these, nine were conducted on the Faulkner Plan, four with randomised block lay-outs and one with a paired plot lay-out.

The yields of practically all the experiments reaped have been very seriously affected by the dry conditions which prevailed during the normal season of maximum growth, i.e. the hot summer months from January to April. The results obtained, however, are not without value ; the action of the various fertilisers in dry years is of interest, as droughts of varying severity are of fairly common occurrence, and again, although the full effect of the fertilisers may not be apparent, the general trend will remain unchanged. Thus a small though significant increase in yield in the crop season under review may, in a more average season, represent a much bigger increase. Again the district most badly affected by the drought was in the north of the Island, where only one of the trials was situated, but it is worth while noting that in this trial, which only gave an average yield of slightly over 11 tons of cane per arpent, a significant increase followed the use of sulphate of ammonia.

TRIALS CONDUCTED ON THE FAULKNER LAYOUT

Nitrogen Trials.—

Three of these trials were reaped, one with a virgin crop at Beau Vallon S.E. and two with a first ratoon crop at Sans Souci S.E. The extra treatments and results are given in Tables VI and VII.

TABLE VI

Estate:	Sans Souci S.E.	Sans Souci S.E.	Beau Vallon S.E.
No. of Trial:	36A	36B	49
Soil Type:	Yellow mature soil, highly laterised	Yellow mature soil, highly laterised	Brownish yellow mature soil, intermediate.
Additional fertilisers applied per arpent:			
"A" plots	62.5 kgs. sulphate of ammonia	+ 37.5 kgs. nitrate of soda	50 kgs. sulphate of ammonia
"B" plots	125 kgs. sulphate of ammonia	+ 75 kgs. nitrate of soda	100 kgs. sulphate of ammonia
"C" plots	250 kgs. sulphate of ammonia	+ 150 kgs. nitrate of soda	200 kgs. sulphate of ammonia

The basal treatment in trial No. 49 included 25 tons of fumier and 14 barrels of molasses per arpent. Any possible border effect in all these trials was eliminated by discarding the two outside rows of each plot.

TABLE VII

CALCULATED RESULTS OF THE NITROGENOUS FERTILISER TRIALS.

Estate:	Sans Souci S.E.	Sans Souci S.E.	Beau Vallon S.E.
No. of trial:	36A	36B	49
Average yield of 10 "S" plots:	29.3 metric tons of cane per arpent	31.9 metric tons of cane per arpent	23.9 metric tons of cane per arpent
Average difference of:			
3 "A" plots	+ 2.5 tons	+ 0.1 tons	+ 1.4 tons
3 "B" plots	+ 5.3 tons	+ 2.9 tons	+ 2.4 tons
3 "C" plots	+ 4.7 tons	+ 2.7 tons	+ 0.3 tons
Significant difference	5.6 tons	3.4 tons	4.8 tons

It is thus seen that the B and C treatments in Trials 36A and 36B have not quite produced increases which may be considered significant. The results of both trials taken together, however, leave little doubt that these applications have increased the crop, but there is no evidence whatsoever that the C treatment is better than the B treatment. In trial 49 there is no reliable evidence that the various applications of sulphate of ammonia have definitely increased the crop. The lack of response to the artificial nitrogenous fertiliser is probably due to the liberal application of farmyard manure and molasses. This is in keeping with previous results that where a sufficient quantity of good quality farmyard manure is applied, little response to artificial nitrogenous fertilisers may be expected.

Phosphate Manurial Trials.—

Three phosphate trials have been reaped, two of them i.e. Trials 22 and 31 being continued in 2nd ratoons from the experiments in 1st ratoons described in the previous Annual Report and the 3rd being a new one with virgin canes at Britannia S.E. (Trial 50). In trial 31 and 50, border effect was eliminated by discarding border rows, but in Trial 22 this could not be done as each plot was only 3 rows wide. Unfortunately Trial 50 was

complicated by the fact that the "A," "B" and "C" plots, in addition to receiving phosphatic fertilisers over and above the basal treatment, also received 8 tons of fumier extra at planting. Consequently any differences between the standard and the treated plots are due to the combined effects of 8 tons of fumier at planting plus the varying applications of phosphatic guano. Any differences, if significant, between the A, B and C plots, will be due to the phosphatic guano.

The amount of additional fertilisers applied and the results obtained are given in Tables VIII and IX.

TABLE VIII

Estate: No. of trial:	St. Aubin S.E. 22	Beau Vallon S.E. 31	Britannia S.E. 50
Soil type ...	Yellow, highly laterised	Yellowish brown, intermediate	Yellow, highly laterised
Additional fertilisers applied per arpent:			
"A" plots ...	125 lbs. phosphatic guano	50 kgs. phosphatic guano	* 100 kgs. phosphatic guano
"B" plots ...	250 lbs. phosphatic guano	100 kgs. phosphatic guano	200 kgs. phosphatic guano
"C" plots ...	500 lbs. phosphatic guano	200 kgs. phosphatic guano	400 kgs. phosphatic guano

* A, B and C plots of this trial also received 8 tons of fumier extra.

TABLE IX

CALCULATED RESULTS OF THE PHOSPHATIC FERTILISER TRIALS

Estate: Trial No:	St. Aubin S.E. 22	Beau Vallon S.E. 31	Britannia S.E. 50
Average yield of 10 "S" plots:	27.3 metric tons of cane per arpent	24.3 metric tons of cane per arpent	37.1 metric tons of cane per arpent
Average difference of:			
3 "A" plots	+ 4.6 tons	+ 0.9 tons	+ 6.4 tons
3 "B" plots	+ 6.0 tons	+ 1.2 tons	+ 7.0 tons
3 "C" plots	+ 8.7 tons	+ 2.2 tons	+ 4.7 tons
Significant difference :	1.2 tons	4.2 tons	3.4 tons

The results of Trials 22 and 31 are in complete accordance with those obtained in the virgin and first ratoon crops, namely that in Trial 22 there is a very decided response to phosphatic fertilisers even in small doses whereas in Trial 31, there is no evidence of any increase in yield following applications of these fertilisers.

In Trial 50, it is seen that the yields of plots A, B and C are significantly higher than that of the standard plots, but that when the A, B and C plots are compared one with the other, there is no significant difference between them. We may therefore deduce that the effect of the 8 tons of pen-manure applied during planting to the A, B and C plots has been to result in a definite increase in yield, in spite of the fact that a further $12\frac{1}{2}$ tons per arpent was applied throughout the trial six months later. It would also appear that there is no significant response to phosphatic fertilisers,

Potash Manurial Trials :

Three of these trials were reaped during the year, two of them, Trials 37A and 37B, being continued in first ratoons from the experiments in virgins described in the previous Annual Report, the third one being a new trial with a virgin crop at Britannia S.E. (Trial 64). In this trial the A, B and C plots in addition to the graduated applications of sulphate of potash also received 5 tons of scums per arpent over and above the basal dressing.

The amounts of additional fertilisers applied and the results obtained are given in Tables X and XI.

TABLE X

Estate: Trial No.:	Sans Souci S.E. 37A	Sans Souci S.E. 37B	Britannia S.E. 64
Soil Type:	Yellow mature soil, highly laterised	Yellow mature soil, highly laterised	Yellow mature soil, highly laterised
Additional fertilisers applied per arpent:			
" A " plots ...	50 kgs. sulphate of potash		5 tons scums 100 lbs. sulphate of potash.
" B " plots ...	100 kgs. sulphate of potash		5 tons scums 200 lbs. sulphate of potash.
" C " plots ...	200 kgs. sulphate of potash		5 tons scums 400 lbs. sulphate of potash.

TABLE XI

CALCULATED RESULTS OF POTASH MANURIAL TRIALS.

Estate: Trial No.:	Sans Souci S.E. 37A	Sans Souci S.E. 37B	Britannia S.E. 64
Average yield of 10 " S " plots:	25.9 metric tons per arpent	27.1 metric tons per arpent	44.5 metric tons per arpent
Average difference of:			
3 " A " plots	- 1.5 tons	+ 3.9 tons	+ 0.43 tons
3 " B " plots	+ 0.8 tons	+ 2.2 tons	+ 1.40 tons
3 " C " plots	+ 4.3 tons	+ 3.7 tons	+ 2.65 tons
Significant difference:	4.4 tons	3.0 tons	5.5 tons

The results of Trials 37A and 37B in general confirm those obtained in the virgin crop, so that increases may be excepted as a result of applications of potassic fertilisers.

In Trial 64, it is seen that the yields from the A, B and C plots are not significantly different from that of the standard plots, and also that there is no real difference between the A, B and C plots. It would thus appear that neither the scums nor the sulphate of potash has definitely increased the yield. The fact that scums, which contain a fair amount of phosphates, has had no apparent effect on the yield, seems to bear out the findings from Trial 50, with respect to phosphates.

Other Lay-Outs :

TRIAL 46.

Trial No. 46 was conducted at St. André S.E. on the randomised block lay-out. It was planted with Big Tanna Mon Désert on 25th April, 1933 and reaped on 28th September, 1934. This trial was adversely affected by the drought in the earlier part of the year, as the supply of irrigation water was very seriously reduced.

The treatments and calculated results are given in Table XII.

TABLE XII

TREATMENTS AND CALCULATED RESULTS OF TRIAL 46.

Plot Series	Treatments	Average yield in tons of cane per arpent	
1.	No phosphatic fertilisers	...	17.4
2.	125 lbs. phosphatic guano	...	18.8
3.	250 lbs. phosphatic guano	...	19.3
4.	500 lbs. phosphatic guano	...	21.3
5.	400 lbs. superphosphate	...	23.0

Significant difference = 9.4 tons of cane per arpent.

This very high error shows that the field is extremely uneven, probably due to the presence of a secondary irrigation canal which often contains water. There would seem therefore, very little hope of ever getting significant results from this field.

By a peculiar coincidence, the yields increase as the amount of phosphatic guano applied increases, whilst the superphosphate has given the highest average yield. The high significant difference, however, shows that these results are absolutely unreliable, so that it cannot be said that the phosphatic fertilisers have increased the yield.

TRIAL 53

This trial was conducted at Benares S.E. on the randomised block lay-out. It was planted with White Tanna in August, 1933, and reaped in the middle of November, 1934. The outside rows of each plot were discarded in order to eliminate as far as possible any border effect.

The treatments and calculated results are given in Table XIII.

TABLE XIII

TREATMENTS AND CALCULATED RESULTS OF N.P.K. TRIAL NO. 53

Plot Series	Treatment	Average yield in tons of cane per arpent	
1.	No further fertilisers	...	21.6
2.	180 lbs. nitrate of soda + 120 lbs. sulphate of ammonia	...	25.3
3.	140 lbs. sulphate of potash	...	21.6
4.	Treatment 2 + Treatment 3	...	27.1
5.	360 lbs. nitrate of soda + 240 lbs. sulphate of ammonia	...	27.8
6.	280 lbs. sulphate of potash	...	22.9
7.	Treatment 5 + Treatment 6	...	27.2
8.	Treatment 7 + 300 lbs. superphosphate	...	29.7

Standard error of the means = 0.88 tons per arpent

The basal treatment consisted of 20 tons of pen-manure plus 300 lbs. of phosphatic guano, all applied at planting.

The chief points which this trial has brought are as follows:

(1) In spite of the large amount of pen-manure applied, the application of the artificial nitrogenous fertiliser has in all four pairs of plots which can be compared produced a significant increase in yield. In one case the double dose of nitrogen produced a significantly higher yield than the single dose, but in the other case, the yields from single and double doses were equal.

(2) In not a single case did the application of sulphate of potash, either in single or double doses result in an increased yield.

(3) Although the basal treatment included 300 lbs. of phosphatic guano per arpent, the yield from plot 8 is significantly higher than that from plot 7, showing that the further application of 300 lbs. of superphosphate has definitely resulted in increasing the yield.

We thus see that under the conditions of this experiment, virgin canes with a liberal dressing of fumier respond to nitrogenous and phosphatic fertilisers but not to potash ones.

TRIAL 65.

This phosphate and potash trial was conducted at Rich Fund S.E. on the Randomised Block Layout. It was planted with M.27/16 in September, 1933, and reaped in October, 1934. The basal treatment consisted of 22 tons of fumier plus 100 kilos of sulphate of ammonia per arpent. The two outside rows on each side of the plot were discarded to eliminate any border effect.

The treatments and average yields are given in Table XIV.

TABLE XIV

TREATMENTS AND CALCULATED RESULTS OF P.K. TRIAL No. 65

Plot. Series	Treatment			Yield in metric tons of cane per arpent
1.	No further fertilisers	...	...	25.1
2.	100 kilos sulphate of potash	...	...	25.5
3.	200 kilos of phosphatic guano	...	...	25.7
4.	100 kilos sulphate of potash + 200 kilos phosphatic guano			26.3
5.	200 kilos sulphate of potash + 200 kilos phosphatic guano			25.6
6.	100 kilos sulphate of potash + 400 kilos phosphatic guano			27.0
7.	200 kilos sulphate of potash + 400 kilos phosphatic guano			24.9

The "z" test shows that the treatments have had a much smaller effect upon the yield than have had the chance errors of the experiment. Consequently, we cannot say that any increases in the average yields are due to the fertilisers applied, the possibility being that they are due to chance errors.

TRIAL 66

This nitrogen, potash and fumier trial was conducted at Bel Air St. Félix S.E. on the paired block lay-out, on the plan given below:

Pen manure			Pen manure			Pen manure			Pen manure			Pen manure		
-N	C	-K	-N	C	-K	-N	C	-K	-N	C	-K	-N	C	-K
-K	C	-N	-K	C	-N	-K	C	-N	-K	C	-N	-K	C	-N
Pen manure			Pen manure			Pen manure			Pen manure			Pen manure		

The trial was planted with BH.10(12) in September, 1933, and was reaped in November, 1924. The outside rows of each plot were discarded in order to eliminate border effect. The various treatments were as follows :

- C = 200 lbs. nitrate of soda + 240 lbs. sulphate of ammonia + 280 lbs. sulphate of potash per arpent.
 -N = 280 lbs. sulphate of potash per arpent.
 -K = 200 lbs. nitrate of soda + 240 lbs. sulphate of ammonia per arpent.

The blocks marked in the plan Pen-manure received this manure at the rate of 12 tons per arpent.

The basal dressing given throughout was 250 lbs. of phosphatic guano at planting and 300 lbs. of superphosphate in December, 1933. This trial enables the following comparisons to be made :

Effect of Pen-Manure.—

The average yield of 5 no pen-manure plots = 19.2 tons per arpent.

The average increase of the 5 pen-manure blocks = 0.9 tons per arpent.

Significant difference = 3.2 tons of cane per arpent.

This seems to show that there is no significant response to pen-manure in this trial.

Effect of artificial nitrogenous fertilisers.—

Taking all the C plots versus the -N plots we find that the application of the nitrogenous fertilisers has resulted in an increase of 2.3 tons of cane per acre, the standard deviation being 0.7 tons per acre. This result is highly significant.

Considering only the blocks where pen-manure was applied, the application of nitrogenous fertilisers resulted in an increase of 1.94 tons of cane per arpent, the standard deviation being 0.2 tons of cane per arpent. This result is highly significant.

In the blocks where no pen-manure was applied, the nitrogenous fertilisers have resulted in an increase of 2.7 tons per arpent, the standard deviation being 1.3 tons per arpent. This result is significant.

Thus in all cases, the application of nitrogenous fertilisers has resulted in significant increases in yield.

Effect of Potash.—

The result of applying potash has been to reduce yields slightly, the reduction amounting to 0.3 tons of cane, both in the manure blocks and the no-manure blocks. This decrease is certainly not significant, so that it would appear that potash has been without effect, under the conditions of this experiment.

It is interesting to compare the results of this trial with those of Trial 53. Both these trials were conducted in soils of a similar type, and were fairly close to one another. In both, nitrogenous fertilisers have produced significant response, and in neither has potash increased the yield.

TRIAL 67.

This trial was conducted at St. Antoine S.E. on the randomised block layout, in a field of D.109(white) which had been cut in the first ratoons at the end of September, 1933, and it was reaped as second ratoons in the middle of September, 1934. This trial dealing with nitrogen and phosphates, was the one most adversely affected by the drought in the early part of 1934, with the result that the average yields are very low. The outside rows of each plot were discarded in order to reduce border effect.

The treatments and calculated results are given in Table XV,

TABLE XV

TREATMENTS AND CALCULATED RESULTS ON THE N.P. TRIAL No. 67.

Plot Series	Treatment	Yield in tons per arpent.
1.	200 kilos sulphate of ammonia per arpent ...	... 11.7
2.	No fertilisers ...	... 10.5
3.	200 kilos sulphate of ammonia + 300 kilos superphosphate per arpent ...	... 12.2
4.	300 kilos superphosphate per arpent ...	... 10.9

Standard error of difference between means = 0.6 tons per arpent.

Treatment 3 is significantly better than treatments 2 and 4, whilst treatment 1 is almost significantly better than treatment 2. There is no significant difference between the following pairs: 2 and 4, and 1 and 3.

We may conclude that in spite of the very bad climatic conditions the nitrogenous fertilisers have definitely resulted in increased crop production, whilst the applications of the phosphatic fertilisers do not seem to have had any such effect.

BORDER EFFECT IN FIELD EXPERIMENTS

Border effect has been much studied of late, in order to find out to what extent fertilisers applied to one plot may benefit the crop in the adjoining plot. With many crops the feeding factor may be the only one of any magnitude, but with a crop like the sugarcane, a further factor may be of importance, i.e. effect of shading due to the more vigorous growth of the canes in one plot. Taking into consideration only the food factor, the rows of cane in an untreated plot next to a treated plot should benefit from the plant food applied to the latter, and consequently the outside row of the untreated plot might be expected to have a higher yield than the inner ones. If however the canes in the treated plot grow very much quicker than those in the untreated, then the shading factor may become important; considering this factor alone then, the yield of the outside row of the untreated plot would be less than that of the inner ones. These two factors then are opposite in effect, and if they are equal in amount, then the resultant border effect is nil, whilst if the food factor is dominant, the border effect will favour the untreated plot, and if the shading factor is dominant, the border effect will favour the more highly fertilised plot.

In order to test some of the points mentioned above, a special trial has been laid down at the Central Experiment Station, consisting of 4 "A" plots and 5 "B" plots. The fertiliser treatment applied to the "B" plots is exactly four times as big as that applied to the "A" plots. This experimental plot was planted in February, 1934, and will be harvested during the crop season of 1935.

Three of the manurial trials reaped during 1934 were harvested row by row to investigate the extent of border effect in them, but unfortunately an error was discovered in one of the balances used in weighing two of these experiments, so that the results have been discarded. The other one for which the results are reliable is the St. Aubin phosphate trial No. 22, in which each plot consists of 3 rows of cane only.

In every case in the untreated plots (i.e. adjoining the A, B or C plots) it was found that yield of the cane rows adjacent to the treated plots was lower than that of the centre row; in the treated plots the yield of the outside rows was always higher than that of the inner. It would thus seem that in this case the shading factor was of greater magnitude than the food factor.

In consequence of the high experimental error in the phosphate trial No. 46 at St. André S.E., three small blocks of cane bordering a secondary irrigation canal were harvested row by row, and as a result of this work it would appear that the yield of four rows nearest the canal has been increased on account of the water.

OTHER INVESTIGATIONS

Other lines of research which have been started, but of which no full description will be given here, as the work is still in progress, include the following :

- (a) An investigation of the exudate from cut canes ;
- (b) The water supplying power of soils by means of soil hygrometers ;
- (c) The forecasting of cane yields in manurial trials by means of cane measurements.

PUBLICATIONS

The following articles have been printed during the year :

1. " Résultats d'une expérience culturale avec de l'engrais phosphaté, faite à l'établissement St. Aubin," *Revue Agricole de l'Ile Maurice*, Janvier-Février, 1934.
2. " Etude sur l'assimilabilité des phosphates dans les sols de Maurice." *Revue Agricole de l'Ile Maurice*, Mars-Avril, 1934.
3. " The use of the Zeiss Sugar Hand Refractometer in Sugarcane Selection Work," *International Sugar Journal*, June, 1934.
4. " A Note on the Qualitative and Quantitative Characters of Sugarcane Seedlings," *Tropical Agriculture*, September, 1934.
5. " The Influence of Rainfall and Maturity on the Properties of Lateritic Soils in Mauritius." *Empire Journal of Experimental Agriculture*, October, 1934.
6. " Some Properties of the Sugarcane Soils of Mauritius." *Bulletin No. 4*, Sugarcane Research Station. This bulletin has been translated into French and printed.
7. " Valeur comparée du fumier et des engrais chimiques," by P. Halais, *Revue Agricole de l'Ile Maurice*, 1934, p. 73.

January, 1935.

N. CRAIG,
Bio-Chemist.

PART III—RESEARCH BOTANY

BY H. EVANS, PH. D.

In the year under review, the physiological division has been mainly concerned with the continuance of root investigations. Much detailed work has been carried out on the root-systems of various sugarcane varieties, over forty varieties having been investigated. At least three, and generally four stools of each variety were examined. The most important aspects of the root system of all the varieties of any commercial value in Mauritius have now been elucidated, but so far on one soil type only. As a future development of the work, it is intended to study the effect of soil on certain selected varieties of cane. Some information on the physiological importance of the various root types, distinguished in previous reports, was obtained by analysis of the liquid exuded from the roots when they are severed from the stool. It was shown, that under dry conditions, the surface roots cease to absorb to any appreciable degree, the stool being supplied with water and mineral substances by the buttress roots, and the deeper roots including rope systems. Under moist conditions, the surface roots absorbed vigorously and owing to their great number, probably supply more water to the stool than the deeper roots. Whereas the deeper roots function continuously, however, there are certain periods during which the moisture content of the surface soil falls to such degree as to render the surface roots quite inactive. These results have already been described in detail in Bulletin No. 5 of this Station, published during the year. The quantitative formation of roots has also been followed for the variety White Tanna.

The detailed description of the root system of different varieties of cane, and the bearing of the results on the practical agriculture of the sugarcane is now in the press, and will appear in print before this report as Bulletin No. 6 of this Station. No further information on the root work will therefore be given here.

The comprehensive experiment on the course of growth in sugarcane has now also been completed. A preliminary account of this work has already been published in previous annual reports. The data have now been analysed, and are ready for publication. The work will shortly be published as Bulletin No. 7 of this Station. It is therefore superfluous to describe the results in this report, as it will be published in completeness before this report appears in print.

EXPERIMENTS ON THE CONTROL OF ARROWING IN SUGARCANE

The problem of the control of flowering in plants has attracted much attention in recent years. The phenomenon of photoperiodism, and the question of the Carbohydrate Nitrogen ratio have been the subjects of considerable research particularly by American workers, while the remarkable phenomenon of vernalization or jarovisation discovered by the Russian investigators have stimulated allied research elsewhere. These problems are intimately associated with the problem of control of flowering ; photoperiodism has as its most striking characteristic the onset or delay or complete retardation of flowering when plants are subjected to varying lengths of day. Some workers claim that flowering can only occur when the ratio of Carbohydrate to Nitrogenous compounds has a value within certain limits. The value of the ratio differs for different plants, and in some cases, the range of values of the ratio in which flowering can occur is so wide that the ratio loses most of its importance. The phenomenon of vernalization, which involves pretreatment

of seed or of vegetative organs of reproduction, causes an alteration in the relative lengths of the vegetative and reproductive phases. The methods adopted include control of temperature, humidity, aeration and light (or darkness), but the exact conditions have to be worked out independently for each variety.

Work on the control of arrowing in sugarcane has two main objects in view, firstly to find whether any practicable means can be resorted to to prevent arrowing of cane in the field. To the planter, the arrowing of cane in the field is a necessary evil since not only is the growing point used up in the formation of the arrow, so that no further growth in length occurs, but canes which have arrowed often die out before harvest resulting in a loss of tonnage.

If some practicable method of retarding or completely preventing arrowing could be worked out, it would be of tremendous benefit, particularly in a dry season such as that of 1933-34, where arrowing was very prolific all over the island.

Secondly, to determine whether arrowing can be controlled at will, and thus make possible various combinations of crosses between different varieties of cane which would otherwise be impossible owing to non-arrowing in a particular locality, or to arrowing at different times.

The problem of controlling arrowing in sugarcane is one of extreme difficulty, mainly caused by the great difference in behaviour of different varieties. In fact, almost every variety has to be treated individually. It is well known, that there are certain broad factors which tend to hasten or delay arrowing. Cross (1) has enumerated some of these factors: in general, bad conditions of growth promote early flowering and good conditions such as irrigation and application of Nitrogen tend to delay arrowing. It is often the case however, that canes arrow even under good conditions of growth, whereas certain varieties do not arrow even when the conditions of growth are extremely bad. For any one particular variety, the border rows almost always tend to arrow before the interior of the field. Whereas, irrigation normally delays arrowing; under the particular conditions (of extreme drought) occurring in Mauritius in the 1933-34 season, irrigation applied in a controlled experiment definitely hastened arrowing as compared to unirrigated controls. This seems to indicate that under dry conditions, dryness of the air may be a more important factor than dryness of the soil.

Venkatraman (2) claims to have delayed arrowing by 9 to 12 days by "topping" i.e. cutting the cane at intervals during the 4th, 5th and 7th month of growth. Canes grown with only 6 hours daylight for 3 months did not flower. When it is considered that the range of the flowering period of canes may be as long as 3 to 4 months, a delay of 9 to 12 days is of little importance. Following the work of Schaffner (3 and 4) in America on maize, an experiment was started in Mauritius at the end of 1932, in which three varieties of cane, M.33/19, BH.10(12) and DK.74 were planted at monthly intervals through the year. It was hoped not only to control arrowing by this means but also to control the sex of the flowers. Schaffner claims to have completely controlled the sex and time of flowering of maize by making bimonthly plantings through the season. Of the three varieties used in our experiments, BH.10(12) did not flower at all in any of the 12 monthly plantings. M.33/19 flowered very profusely: in the first planting (October, 1932) 91.1% of the canes arrowed, the values for successive plantings being:—November, 1932: 91.9%; December, 1932: 90.9%; January, 1933: 92.1%; February, 1933: 70.5%; March, 1933: 64.5%; April, 1933: 50%; May, 1933: 10%. At the time of this examination (June 6th), there were no arrows in the later plantings aged 9 to 12 months.

There was no significant difference in the time of emergence of the arrows in the different monthly plantings for the first 6 plantings, and no significant difference in the degree of flowering in the first 4 plantings. Towards the end of September, there was marked attempt at arrowing by the late plantings (6th to 10th plantings). The arrows on these small canes reached the flag stage, but did not emerge, and soon withered and died. M.33/19 is predominantly female, and time of planting had no effect whatsoever on the sex of the flowers, hardly any pollen was shed by any of the arrows of the different plantings. Thus, although there was no significant difference in either time or degree of arrowing in the first four plantings, in the later plantings flowering was delayed. Where the delay was very marked as in the 6th to 10th plantings, normal arrowing did not occur. The conditions in Mauritius appear to be deleterious to the normal emergence of arrows after the months of August or September.

In the variety DK.74, arrowing was not nearly so profuse as in M.33/19, the percentage of canes which arrowed in the first monthly planting was 20%, in the second 6%, while there was an average of 2 arrows per 12 stools in the 3rd, 4th and 5th plantings. At the normal arrowing season no further arrows were formed, but here again there was a marked attempt at arrowing by the late plantings after the normal season had finished. As in M.33/19, the arrows reached the flag stage, but never emerged. There was in DK.74 a difference between the time and degree of arrowing of the 1st monthly planting as compared to the later plantings, but the number of canes which flowered in the later plantings were so few as to make the result of doubtful significance. That time of planting can only be a subsidiary factor in arrowing is indicated by the fact that not one of the BH.10(12) canes arrowed in any of the plantings.

Another experiment was laid down with the object of testing the effect of heavy application of fertiliser on arrowing. The details of the treatments have been referred to in previous annual reports. The variety used was DK.74, and there were four treatments as follows:—1. heavy dressing of lime ; 2. heavy dressing of phosphate ; 3. heavy dressing of nitrate ; 4. small dressing of potash and phosphate but no nitrate. As in the monthly planting experiment, DK.74 only arrowed to a slight degree in this experiment.

There were only 10 arrows in 36 stools of the no-nitrate plot ; 6 in the heavy lime plot, and none in the heavy nitrate or heavy phosphate. Arrows in the no-nitrate plot appeared about three weeks earlier than those in the heavy lime plots. There was no difference in the sex of the arrows in the two treatments. It is difficult to explain why arrowing of DK.74 was so sparse, in a season of such profuse arrowing, since this variety arrows to quite an appreciable degree in this locality in normal years. That the fertilisers had caused a response in growth is obvious from the mean weight of stool at the end of the experiment ; the values being: heavy lime 10.08 kgs ; heavy phosphate 8.94 kgs ; heavy nitrate 7.07 kgs. ; no-nitrate 4.48 kgs.

Root-pruning experiments on several varieties 3 to 4 months before the commencement of the arrowing season caused no significant difference in the time or degree of arrowing in spite of the fact that over one-third of the roots were removed.

Defoliation of the shoots (i.e. removal of all the leaves except two or three leaves at the apex) appeared to have quite a marked hastening effect in some varieties, but had no effect in other varieties. In the variety BV.29/30, there were 18.5% of arrows 1 month after the defoliation, whereas in control plots on each side, there were at the same time no arrows. In Uba Marot, there were 60% arrows in the defoliated plot and 40.4% in the control plot. In Uba seedling, there were 15% arrows in the control plot and 36% in the

treated plot. In all cases, the difference between the percentage of arrows in the control and treated plots became significant about a month later. Defoliation in these varieties thus seemed to hasten arrowing but had no permanent effect on the degree of flowering.

In the case of Uba, there was not even a hastening effect, and defoliation failed to induce arrowing in BH.10(12) and White Tanna.

EXPERIMENTS ON THE SOAKING OF SETTS BEFORE PLANTING

Two field trials were laid down at the end of 1932 to investigate the effect of soaking on the germination of cuttings and on the final yield of cane. The details of the treatments and the germination results have been described in the Annual Reports for 1932 and 1933. There were four treatments: 1. soaked in a saturated solution of lime; 2. soaked in a saturated solution of lime containing also 1 lb. Magnesium sulphate per 50 gallons; 3. soaked in complete nutrient solution; 4. soaked in water alone. Soaking was for 8 hours in the P.E.S. experiment and 16 hours in the Trianon Experiment. There was a very marked improvement in the rate of germination of the soaked setts as compared to the unsoaked controls, and the following increases in yield were obtained in the virgin crop at Pamplémousses Experiment Station.

Mean yield of 30 control plots	...	...	=	15.66 tons per acre.
Increase in yield per acre (lime solution only)	...	...	=	6.53 tons per acre.
Increase in yield per acre (lime + magnesium sulphate)	...	...	=	6.04 tons per acre.
Increase in yield per acre (complete nutrient solution)	...	...	=	4.54 tons per acre.
Increase in yield per acre (water alone)	...	...	=	4.78 tons per acre.
Standard error of differences	...	...	=	± 0.80 tons.

All these increases in yield were fully significant, the lime alone and lime plus magnesium sulphate being equally the best.

The experiments were carried out on first ratoons, it being thought that the stronger virgin stools formed as a result of soaking might lead to an increase in yield of the ratoon crop also. The results for the ratoon crop are now available, and are given below:

Mean yield of 30 control plots	...	...	=	15.40 tons per acre.
Difference in yield due to soaking in lime	...	...	=	+ 2.05 tons per acre.
Difference in yield due to soaking in lime + magnesium sulphate	...	...	=	+ 2.65 tons per acre.
Difference in yield due to soaking in complete nutrient solution	...	...	=	+ 1.18 tons per acre.
Difference in yield due to soaking in water alone	...	...	=	+ 1.04 tons per acre.
Standard error	...	...	=	± 0.50 tons per acre.

The interpretation of the results is the same as in virgins, viz:

- (1) All the treatments significantly better than the controls.
- (2) No significant difference between soaking in lime alone and soaking in lime plus Magnesium sulphate.
- (3) No significant difference between soaking in complete nutrient solution and soaking in water alone.
- (4) Soaking in either lime solution or lime plus Magnesium sulphate solution decidedly better than soaking in either water or complete nutrient solution.

We thus come to the conclusion that the benefits of soaking are apparent, not only in the virgin yields, but in the first ratoon yields also, although, as would be expected, the increases in yield in the ratoon crop are less than those obtained in the virgin crop.

NOTE.—It is interesting to record here that, since the yields of every plot in virgins and in first ratoons are known, data were available to test the consistency of the plots as regards yield, and the correlation coefficient between the yields of each plot as virgins and as first ratoons was worked out. There were 58 plots for comparison, and the Correlation Coefficient was $+ 0.70 \pm 0.068$, indicating considerable consistency in the behaviour of the plots as virgins and first ratoons respectively.

The sett-soaking trial at Trianon S.E. was reaped as virgins in October, 1934, and the following are the results obtained:

Average yield of all control plots	...	...	=	20.2 tons per acre.
Increase in yield due to soaking in lime solution	...	...	=	+ 3.5 tons per acre.
Increase in yield due to soaking in lime + Magnesium sulphate	...	...	=	+ 2.1 tons per acre.
Increase in yield due to soaking in complete nutrient solution	...	...	=	+ 1.5 tons per acre.
Increase in yield due to soaking in water alone	...	...	=	+ 2.1 tons per acre.
S.E.	...	...	=	± 0.72 tons per acre.

The results indicate that:

- (1) All the soaking treatments have caused a significant increase in yield.
- (2) There is no significant difference between the lime plus magnesium sulphate, complete nutrient solution, and water.
- (3) Lime solution alone is the best soaking medium.

Further work has been carried out on the soaking of cuttings with a view to shedding more light on the mechanism of the process whereby quicker and better germination and eventually increased yields are obtained as a result of soaking.

It was thought that soaking would initiate a rapid hydrolysis of sucrose and the activation of processes involved in growth such as occurs when the dormancy of seeds and other vegetative parts is broken, and germination begins. The reducing sugar content of the cutting would provide an index by means of which this process could be followed. A sample of 20 cuttings were taken and 3 bores taken with a cork borer out of each, and the reducing sugar content determined on the borings by the micro ferricyanide method of Hagedorn and Jensen. The cuttings were then soaked in a saturated solution of lime for 12 hours, samples of cuttings being taken (a) immediately after removal from the solution, (b) one day after removal, (c) two days after removal, (d) three days after removal. The reducing sugar content was determined for the cuttings at the intervals specified above, by taking new bores with a cork borer as close as possible to the first bore. The results obtained from the second boring in all cases agreed very closely with the original value, when allowance was made for the water absorbed, the average difference between the two determinations being about 5%. No marked hydrolysis of sucrose occurs as a result of soaking, at least up to a period of 3 days after the cutting has been removed from the solution.

The experiment was repeated, soaking the cuttings in water, with identical results. The next experiment was to determine the amount of water absorbed by the cuttings from the solutions in which they are soaked. This will naturally depend on the original condition of the cutting. The results of the sett-soaking trials have shown that the lime solutions were significantly better than water alone or water containing the three important nutrients (K, P and N). It was therefore of interest to find wherein the difference between a lime solution and water lay. The amount of water absorbed by a uniform sample of cuttings from the two media provided the answer to this question. In all cases more water was absorbed by cuttings from a lime solution than from pure water. The increase in weight of a sample of cuttings soaked in water was 1.2% (S.E. = ± 0.08), and in lime solution 1.75% (S.E. = ± 0.09). The difference in amount of water absorbed 0.55% (S.E. = ± 0.12) is fully significant.

It may be suggested that the greater increase of weight of the cuttings soaked in the lime solution over those soaked in water may be due to absorption of lime. A further experiment was carried out to test this point; the lime content of a sample of cuttings before and after soaking in lime solution was determined, with the following results.

		% Fresh Matter.	
Ca content (as Ca)	Before soaking	...	+ 0.042 $\pm$ 0.003
	After soaking	...	+ 0.047 $\pm$ 0.003
		% Dry Matter.	
	Before soaking	...	+ 0.144 $\pm$ 0.006
	After soaking	...	+ 0.153 $\pm$ 0.006

It will be seen that the difference in Ca content is so small as to be negligible, and we may safely conclude that cuttings do not in 12 hours absorb any appreciable amount of lime from a lime solution.

A little sucrose is lost from the cutting into both lime solution and into water, but the amount is about equal in both, and probably mainly comes from cut cells.

Similarly, by microchemical methods, it was shown that only minute traces of minerals enter into the cutting when it is soaked in a solution containing abundant minerals. We therefore come to the conclusion that the differences between various soaking media in their ability to promote better germination and increased yields lie in the water relationship of the cutting in these media. This explains why no significant difference was shown when setts were soaked in a complete nutrient solution and in pure water respectively. The two treatments really are the same in that the mineral substances do not enter and water is absorbed as from pure water.

The lime solutions on the other hand were significantly better than the water, and this is explained by the fact that cuttings absorb more water from a lime solution than from pure water.

When a cutting is planted normally in the field, before it can "germinate" it must become fully turgid, and the process of absorption of water from the soil is a slow one, particularly when the soil is dry. Some of the "buds" often die out before the cutting has absorbed enough water to initiate the germination processes, particularly those buds which are nearest the cut ends of the cutting. When the cutting is soaked, it becomes fully turgid, and therefore does not need to absorb water from the soil to initiate germination. The cutting not only gains a valuable start, but in addition all the buds remain alive and the advantages gained in these early stages are retained, leading to a more vigorous and healthier stool, with more canes,

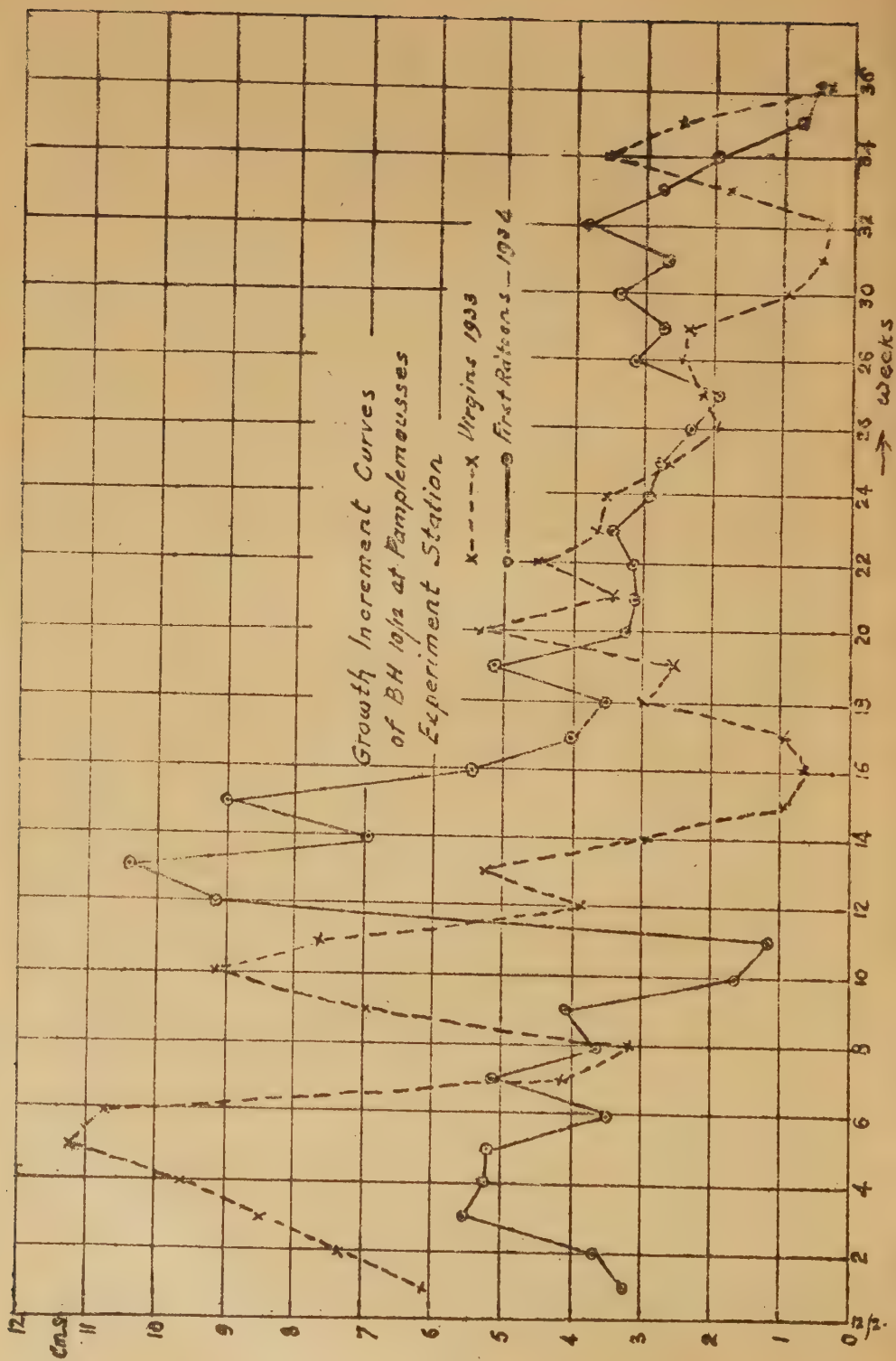
giving higher yields not only in the virgin, but also in the ratoon crops. In addition, the practice of soaking in lime results in complete mortality of all the borer larvae which happen to be in the cutting, probably also in a disinfecting action against fungoid and bacterial organisms, and certainly in much reduced recruiting and consequently a more uniform stand of cane.

It is after the cutting has been planted in the field, and has been incubated in the dark under favourable temperature and moisture conditions that renewed activity of vital processes commences ; the soaking does not of itself immediately cause this activation, it merely provides one favourable condition (viz: moisture content), this being the condition which is normally the only unfavourable one in Mauritius during the normal planting season.

There is considerable variability in the germination of cuttings planted in the field, some cuttings germinate very quickly whereas others remain dormant for a considerable period ; in some cases so long, that the cutting is attacked by fungi, bacteria or insects, resulting in a complete failure of that particular hole, and necessitating the planting of recruits. It is true that soaking in a lime solution considerably reduces this variability, nevertheless the variability is still high particularly when considered from the standpoint of obtaining uniform material for experimental purposes. It occurred to the author that this variability in part might be due to a difference in the internal or physiological condition of the cutting, and that the reducing sugar content might serve as an index to this condition. This view is supported by other considerations e.g. (1) that canes with wild blood, in which the reducing sugar content is fairly high, germinate rapidly, (2) that vegetative activity in the top of a cane is associated with a relatively high reducing sugar content, as contrasted to the dormant storage section of the stem where the reducing sugar content is low, (3) rain during the harvesting season causes renewed growth and loss of purity. Vegetative vigour thus appears to be correlated with reducing sugar content.

In view of these considerations, it was thought desirable to investigate the relationship if any between the reducing sugar content of the cutting, and the time required for germination under uniform conditions. For this purpose it is necessary to use a micromethod for the determination of reducing sugars, since not only the content of reducing sugars be determined, but the cutting must afterwards be available for planting. The Hagedorn Jensen method as modified by Widdowson was used, three borings being taken with a cork-borer from each cutting, and the juice extracted in a hand press. Repeated determinations on the same cutting showed that three bores taken thus gave good agreement with the mean reducing sugar content of the whole cutting. Determinations were carried out on 40 cuttings ; these were numbered and planted under uniform conditions in the field. Although the cuttings had a similar external appearance, the reducing sugar content per 100 cc. juice varied from 0.192 to 1.310 grs. The number of days required for germination varied from 32 days to 55 days. There was a very significant negative correlation between reducing sugar content and days required for germination, the value of the coefficient being -0.62 ± 0.097 i.e. the higher the reducing sugar content the quicker the germination. This does not mean that high reducing sugar content is the *cause* of quick germination, but that the reducing sugar content is a reliable index of the condition of the cutting with regard to its germinating capacity. Undoubtedly, this explains to a large degree the variability in the rate of germination of the cuttings.

For quick and uniform germination, it is thus necessary among other things to obtain cuttings with a high and approximately equal reducing sugar content. It is of course impracticable to determine the reducing sugar content



per cutting for large plantings, and even for comparatively small-scale field trials. Nevertheless, an attempt should be made to obtain cuttings of high reducing sugar content. For any one particular variety such cuttings might be expected

- (1) if cuttings from young canes rather than from mature canes be taken ;
- (2) if cuttings are taken whilst the growing conditions are good (i.e. when external conditions such as temperature and soil moisture are high) ;
- (3) if cuttings from canes inside a field rather than from the borders are taken.

Where uniform material for very small scale trials is needed it might be worth while to determine the content of reducing sugars and select the cuttings on the basis of high (and uniform) reducing sugar content, other conditions being equal.

GROWTH RATE MEASUREMENTS

Growth rate measurements were continued on BH.10(12) in first ratoons at Pamplemousses Experiment Station during the current year. A random sample of 100 canes was taken as with virgins in 1933. The canes were not irrigated, so that the yield of cane was rather low but compared favourably with the yield of cane as virgins in 1933, the yields being 15.66 and 15.40 tons per acre for virgins and first ratoons respectively. This approximate equality of final yield is rather strikingly borne out by the growth increment curves for the two years, which are plotted in the Figure. Since the curves represent growth increment per week plotted against the corresponding weeks, the total amount of cane formed will be represented by the area enclosed by the curves. The areas so enclosed are 70 sq. cms. and 68.5 sq. cms. by the curves for the virgin and ratoon canes respectively, showing close proportionality to the actual yields obtained (15.66 tons and 15.40 tons, respectively). In spite of the fact that the final yields were approximately equal, the seasonal conditions during the two years differed considerably. In the virgin crop, about half of the final growth was formed between the months of February and the middle of May, whereas in ratoons, half the final growth was not formed until a month later. The maximum growth rate in the virgins occurred in the middle of March, 1933, whereas in ratoons, the maximum growth rate did not occur until the middle of May, 1934. This is due to the unprecedented drought which occurred in Mauritius in the summer months of 1931. Growth conditions were very similar in the two years, during the months of July and August.

Owing to the extreme dryness of the first half of the growing period, a good correlation of growth with soil moisture is obtained (+ 0.67) whereas correlation with temperature is comparatively poor (+ 0.38). This is practically the reverse of the correlation effects obtained in normal years. Also, owing to the fact that active growth was not possible in 1934 until the beginning of May (when the temperature was dropping) rates of growth never attained the 1933 values. At this time, an increase of 10% in soil moisture could only produce an increased growth of 5.0 cms. per week, whereas in February or March, it could have produced an increased growth of 6.0-6.5 cms. per week. During the " cold " season (middle of June to middle of October), an increase of soil moisture of 10% caused an increase in growth of 1.85 cms. per week, as compared to 1.7 cms. in 1933. There is possibly no significant difference between these two values, but it may mean a slightly more vigorous growth in the winter of 1934, owing to the fact that the canes were not so advanced as in the previous year, it being known that less fully developed canes are capable of more active growth under otherwise similar conditions, than more mature ones.

Evidence is accumulating that the degree of response of canes to soil moisture is a definite varietal characteristic, when other climatic conditions are similar. Thus, it has been shown that the response is different during the three periods defined in previous annual reports, viz : the period before the grand season, the grand season period, and the period following the grand season. Under the conditions of temperature obtaining during these periods in Mauritius, the response of various varieties (in terms of growth in length) to an increase in soil moisture of 10% have been as follows :

	<i>Before grand season</i>	<i>Grand season</i>	<i>After grand season</i>
White Tanna	... 5.0	5.0	1.5
POJ.2878	... 5.0	7.0	1.0
BH.10(12)	... —	6.0	1.7

These values have now been confirmed in 1st ratoons as well as with virgin canes at Pamplemousses Experiment Station. A semi-diagrammatic representation of the varietal response to increase of soil moisture during the year is shown on facing page.

To obtain more exhaustive information on the detailed growth characteristics of different varieties, it is necessary to carry out determinations more similar to those described in the Course of Growth experiment. Data on length of cane only are not sufficient to elucidate all the aspects of growth in sugarcane. Firstly, because data on length are not 100% efficient even in determining the growth of the canes, for growth in diameter is also taking place, and moreover, growth in weight might occur without an equivalent increment of length. One of the most accurate indices of growth of the cane is the dry weight of the cane. Secondly, measurements on cane only do not take into consideration the roots and leaves both of which exercise a paramount influence on the growth of the stool as a whole. In future growth experiments, it has therefore been decided to concentrate on determinations similar to those carried out in the course of growth experiment.

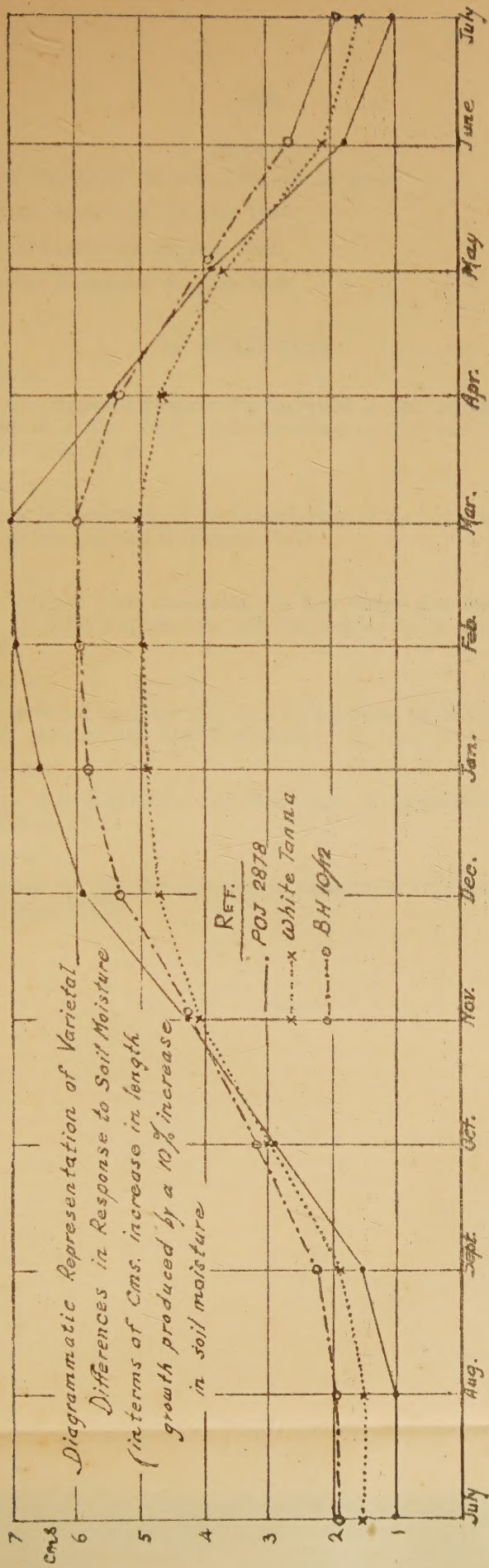
STATISTICAL WORK ON THE BEST SHAPE AND SIZE OF PLOT FOR FIELD EXPERIMENTS WITH SUGARCANE

Preliminary work on the best size and shape of plot was carried out at Trianon S.E. by courtesy of the Manager. These results were mainly concerned with small-scale field trials, and as a result of the conclusions drawn from the work, certain innovations which have led to more accurate and satisfactory lay-outs of field experiments have been adopted. The results of this work were published during the year as Bulletin No. 3 of this Station. Further work of this nature has now been carried out—mainly designed to obtain information on large scale field trials. All the cane on six acres of land were weighed as twenty hole plots at St. Aubin S.E. by courtesy of the Manager. The maximum length of row was 100 holes, so that it will be possible to calculate the standard error of plots up to 100 holes in length and any width required.

The results have not yet been analysed, but it is hoped to do so in the near future.

Réduit,
January, 1935.

H. EVANS,
Physiological Botanist.



I. REPORTS

1. First Annual Report for the year 1930 (out of print).
2. Second Annual Report for the year 1931.
3. Third Annual Report for the year 1932.
4. Fourth Annual Report for the year 1933.

II. BULLETINS

1. *Bulletin No. 1 :*

- (a) Results of Manurial Experiments harvested in 1931 and 1932 ;
 (b) Results of Variety Yield Trials harvested in 1931 and 1932,
 by N. Craig, M. Sc. (1933)

2. *Bulletin No. 2 :*

- Preliminary Investigations of the Growth Rate of the Sugarcane ;
 A. Glendon Hill and H. Evans, Ph.D. (1933)

3. *Bulletin No. 3 :*

- Some preliminary Data concerning the best Shape and Size of
 Plot for Field Experiments with Sugarcane, by H. Evans,
 Ph.D. (1934)

4. *Bulletin No. 4 :*

- Some Properties of the Sugarcane Soils of Mauritius, by N. Craig,
 M. Sc. (English and French editions) (1934)

5. *Bulletin No. 5 :*

- Studies on Root-Exudation and Root-Type in Sugarcane by
 H. Evans, Ph.D. (1934)

6. *Bulletin No. 6 :*

- Investigations on the Root-System of Sugarcane Varieties by
 H. Evans, Ph.D. (1935)
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